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VOL. XIX JUNE, 1923 NO. 6

CONTENTS:

	PAGE
AFTER LINCHENG, WHAT?	363
THE SILENCE OF THE SAMURAI	365
THE TAIL OF THE DOG	367
Safe and Sane	372
GOVERNMENT SUPPORT TO AMERICAN PUBLICATION IN CHINA	373
JAPAN'S POLICY TOWARDS CHINA	374
ILLEGAL TAXATION IN CHINA	375
A SPLENDID ACHIEVEMENT	375
STANDARDIZATION AND THE URGENT NEED OF ITS APPLICATION TO THE ELECTRIC POWER SUPPLY INDUSTRY IN CHINA	376
SHANGHAI AS A FIELD FOR ELECTRIC FURNACES	378
BLAST FURNACES AND STEEL MILLS IN CHINA, 2	*379
GOLD ORE DEPOSITS OF THE LINGLUNGSHAN REGION, TSAOYUEN, SHANTUNG	*383
CHINESE ENGINEERING WORKS IN SHANGHAI	*390
THE COAL RESOURCES OF ASIATIC RUSSIA	*391
PROGRESS IN THE FORMOSA SUGAR INDUSTRY	*395
PROGRESS IN THE RICE INDUSTRY	*398
MOTOR CULTIVATION IN INDO-CHINA	*400
THE MANILA RAILWAY	*402
THE MANILA GAS WORKS	*406
THE RUBBER INDUSTRY IN THE DUTCH EAST INDIES	*408
MACHINERY MANUFACTURE IN JAPAN	*412
SHORT SKETCHES OF JAPAN'S MACHINE MAKERS	417
Praise for Japanese Engineers	419
UNZEN	*420
SIAM ADVANCING	*422
SIAM STATE RAILWAYS	*423
LABUAN	*426
THE MUSASHINO ELECTRIC RAILWAY	*427
ELECTRIC LOCOMOTIVES FOR JAPANESE GOVERNMENT	*428

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Brunswick-Kroeschell Co., ... 36
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Electricity Department, S. M. C. 4
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Heap & Co., Ltd., Joshua 53
Hongkong Rope Manufacturing Co. 20
Hongkong & Shanghai Banking Corporation 59
Hongkong & Whampoa Dock Co., Ld. 30
Hotel Statler Co. 63
Humber, Ltd. 7

Imperial Japanese Government Railways 68, 69
Industrial Bank of Japan 58
International Banking Corporation 55
International General Electric Co., Inc. 51

Japan Sugar Co., Ltd. 6
Jardine Engineering Corporation, Ltd., The 12
Jones & Lamson Machine Co. 53
Jugo Ginko 56

Kanegafuchi Spinning Co., Ltd. 10
Kawasaki Dockyard Co., Ltd. 35
Kellogg Switchboard & Supply Co. 74 & Under Index
Kokusai Kisen Kaisha 45
Koster Co., The, ... Cover

London Directory Co., Ltd. 61
Low & Sons, Ltd., Archibald 8

Manning, Maxwell & Moore, Inc. 64
Mather and Platt, Ltd. 21
Matthews & Yates, Ltd. 42
Metropolitan Vickers Electrical Co, Ltd. 76
McClintic-Marshall Products Co. 27
McConway and Torley Co. 39
Mitsubishi Bank 57
Mitsubishi Iron & Steel Co., Ltd. 38
Mitsubishi Marine & Fire Ins. Co., Ld. 38
Mitsubishi Shoji Kaisha 18
Mitsubishi Warehouse Co. 38
Mitsubishi Zosen Kaisha, Ltd 36
Mitsui Bank 57
Mitsui Mining Co. 18
Mitsui Bussan Kaisha 26
Morse & Son, Inc., A. J. 61
Motor Rail & Tram Car Co. 41
Mustard & Co. 39

New Engineering & Shipbuilding Works 34
New Imperial Cycles, Ltd. 41
Nippon Menkwa Kabushiki Kaisha 50
Nippon Yusen Kaisha 46, 47
Nobel Industries, Ltd. 22

Okura & Co. (Trading), Ltd. 24
One Hundredth Bank, Ltd., The 59
Oster Manufacturing Co. 8

Pooley & Son, Ltd., Henry 2

Redpath Brown & Co., Ltd. 64
Royal Bank of Canada 61
Ruston & Hornsby, Ltd. 42

Sale & Frazar, Ltd. 16
Shanghai Dock & Eng. Co., Ltd 32
Shanghai Municipal Council 4
Siber Hegner & Co., Ltd 11
Simons & Co., Ltd., Wm. 14
Smith Major & Stevens Ltd. 7
South Manchuria Railway Co. 66, 70, 71
Standard Oil Co. of N. Y. 29
Standard Underground Cable Co. 65
Sulzer Bros. 428
Sumitomo 60
Sumitomo Bank, Ltd. 60
Superheater Co., The 4

Thornycroft & Co., Ltd. John I. 1
Toshin Soko 40
Toyo Kisen Kaisha 43
Trimont Manufacturing Co. 9

United States Steel Products Company .... 23, 37, Back Cover

Walworth International Co. 76
Westinghouse Electric International Co. 17
Wharton Jr. & Co. Inc., Wm. 21
Whittall & Co., Ltd., J. 9
Wild & Co., M. B. 6
Williams & Co., J. H. 33

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JAPAN'S MACHINERY MANUFACTURERS

FORMOSA SUGAR INDUSTRY

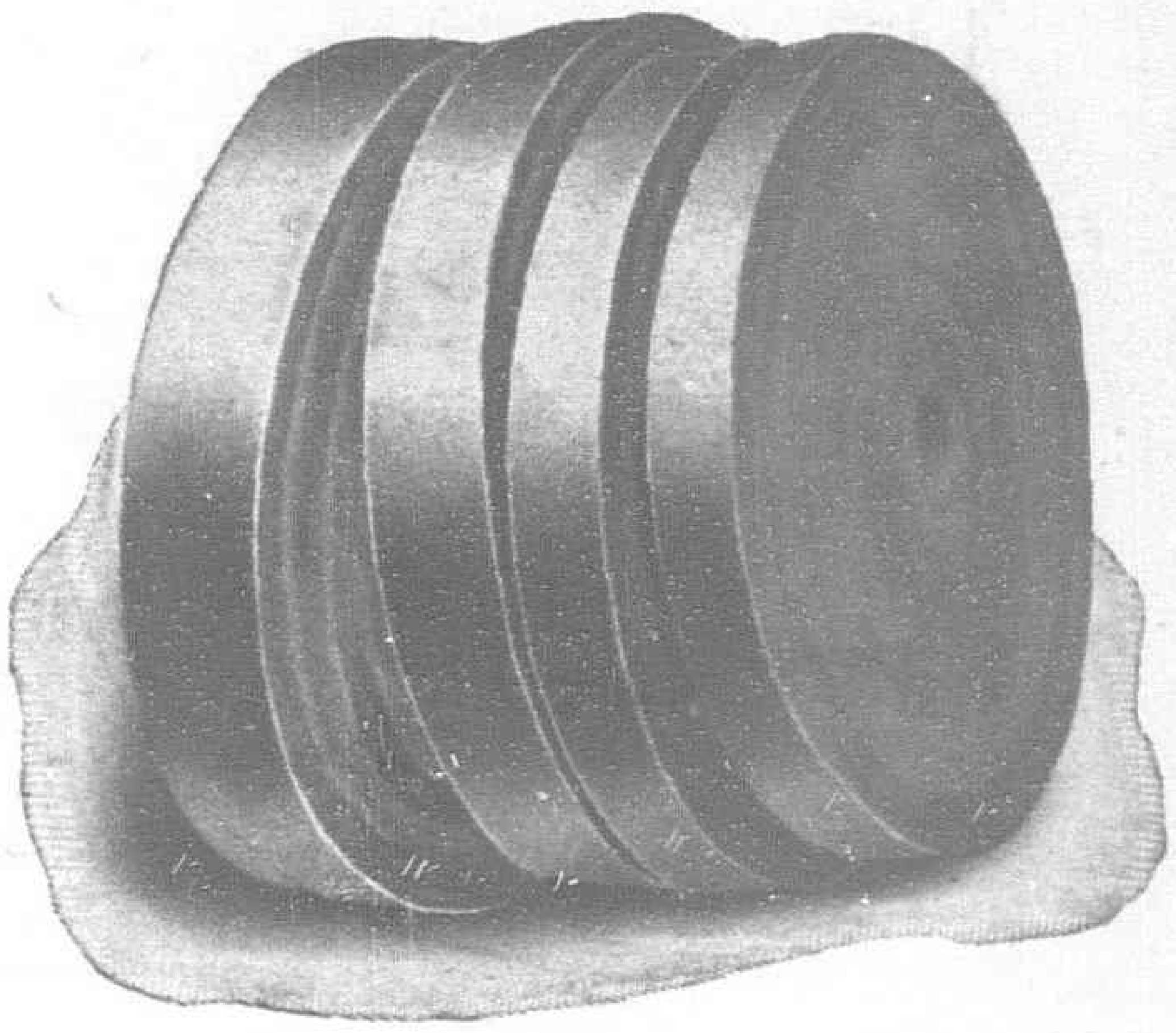
THE TAIL OF THE DOG
Sidelights on the Origins and Impulses Behind the Opposition in China to Co-operation with Japan

AFTER LINCHENG, WHAT?

Vol. XIX June, 1923 No. 6

SHANGHAI, PEKING, TOKYO AND MANILA

22



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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XIX SHANGHAI, JUNE, 1923 No. 6

After Lincheng, What?

The North-China Daily News voices the sentiment of every foreigner in China in asking " What Will Come of Lincheng " ? Down deep in our hearts echoes the answer, Nothing ! Yet something must be done or it will not be long before the gunboats will be rushing to save the lives of surviving foreigners in some interior treaty port. Unless the Chinese are impressed with the fact that they cannot violate the persons of foreigners with impunity, the decline of Western prestige in this country will date from the outrage on the Tientsin-Pukow express, in itself, the culmination of other serious outrages permitted to pass unpunished. Our opinions are so thoroughly in accord with our contemporary that we reproduce this timely editorial in full :

" By the general tenour of the news from Tsaochuang, the captivity of the foreigners still in bandit hands should not last for many more days. Putting it plainly, the bandits are being bribed by enrollment in the army to release their prisoners and the bribing seems already to have begun. If the Chinese authorities prefer that way of settling the matter, that is their business. The main thing, for the moment, is to get the prisoners freed. But the satisfaction felt at the prospect of this wish being realized is damped by the extremely unsatisfactory state of affairs generally. It will be remembered that the diplomatic body informed the Chinese government that they had decided " to claim heavy progressive indemnities for every twenty-four hours' delay in the liberation of the captives beginning at midnight on May 12." It is clear that this threat frightened nobody in Peking ; and now it is open to question whether even this very feeble waggling of the big stick is not forgotten. Apart from it we have not heard one single definite expression of the diplomatic body's intentions to exact punishment for Lincheng and prevent its recurrence. Increasing apathy pervades the atmosphere. There is very serious danger that, once the captives are free, everybody will be so pleased that nothing more will be done. Be sure the Chinese officials are counting on this.

"Important as it is to free the captives, we emphasize at the risk of seeming callous—though we hope no one will accuse us of that —that this is a secondary matter compared with the overwhelming importance of bringing the Chinese ruling classes to a sense of their duty. As has frequently been pointed out, Lincheng is but the culmination of an increasing tendency to do violence to foreigners and their interests. If the wrecking of the Tientsin express goes unpunished, it is certain that we shall have something very much worse to record in a near future. The method actually used by the Chinese authorities to get the prisoners released is a direct encouragement to others to go and do likewise. On this occasion it has been a train wrecked and thirty-five foreigners carried off. Next time it will be some internal treaty port, very likely Hankow or Kiukiang, attacked and a whole community rapt away.

" There is much speculation as to who precisely instigated the bandits' outrage at Lincheng. That is certainly an interesting question and, if cleared up, might aid the foreign powers in exacting retribution, supposing they acted on it. What we would emphasize again is that, whoever the instigator, the circumstance itself is so bad and so serious that it calls for the most resolute handling. It springs from the anarchy and multiplication of petty chieftainships which is the curse of China to-day and the method of dealing with it and the utter feebleness of the foreign governments' attitude is a direct incentive to these evils.

It is perfectly useless to expect to remedy these conditions by representations to and pressure on Peking. Even if it had the will to improve matters, it has not the power. The root of all trouble is that there is not one government in China but eighteen. That is what the powers have persistently ignored, conspicuously so in the deplorable fatuities of the Washington conference, but also in all their dealings with this country, collectively and individually. This delusion must be knocked out of the minds of the chancelleries of Europe and America, and we look to the diplomatic body, reinforced as they are by the resolutions of the mass meetings in Shanghai and Hankow, to do it. We shall not get better government in China until the provincial authorities are hit at. To do so need not mean the spending of extra money. It merely means, for a commencement, using the foreign troops and naval forces that actually are in China, by parcelling them out among the treaty ports and provincial capitals most accessible by river or rail, with authority to use their power and hold the local magnates personally responsible, if necessary arresting them, in case of disorder and wrong-doing. And we are sure that nothing would so quickly induce the said magnates to become reconciled among themselves for the setting of China's house in order, which is the great desideratum to be sought for in the Lincheng affair. For the foreigner cannot intervene to create a government in China himself ; but he can put such unpleasant pressure on the Chinese officials as will compel them to create it. If Great Britain and America would come together and recognize the situation in China as it is, would frankly face the fact that by herself she will never become united and that a certain measure of coercion and tutelage is not only indispensible but would be welcomed with profound relief by millions of Chinese, would consider with an unbiassed mind whether such a policy might not be pursued with small expenditure, there could be no question that the other powers would heartily agree."

Every virile foreigner in China irrespective of nationality will endorse these views and the sooner editorial and public opinion crystallyzes along these lines, the better it will be for all. There has been altogether too much gush and flub-dub over China ; too many divergent opinions of what should be done ; too many heroes ; too many negotiators ; too many seekers after publicity : in fact, too many fingers in the pie, to bring about any definite policy or action.

* * *

America and Great Britain, especially the former, must come to a decision as to whether their policies towards China are to be shaped by sentiment or trade, whether our missionary and educational interests are more important than business. This is a blunt way of putting it, but it is well to look the facts square in the face and see where we are heading. It may be said without undue exaggeration that every cent of profit on American trade with China is returned as a free gift for the uplift of its people. The trade returns prove this statement. The value of American exports to China in 1921 was Taels 176,000,000 and imports Taels 89,000,000 (of the latter about 40 per cent. passed through American firms) making a total of Taels 212,000,000 on which we may assume a five per cent. profit (as a matter of fact, most firms lost heavily) or Taels 10,600,000, approximately $7,500,000 gold. It is difficult to ascertain the total expended for the maintenance of missions, educational institutions, hospitals, christian associations, flood and famine relief, endowments and other charities, but it is fair to take the annual contribution at somewhere near ten million dollars. And to this the thirty odd million gold owed to our bankers and merchants by the Chinese government, the advances for the construction of cotton mills and other enterprises now in default, pile on the losses incurred by the 300 odd American firms who swarmed into China and got stung, the wallop received by the banks on exchange, and it begins to look as though Americans were in business in China solely for the benefit of the Chinese. The maintenance of our charities alone equals the profits accruing from our trade, which in plain words says that our main business in China is to distribute these profits in uplift work, a huge industry in itself requiring a personnel almost as large as that employed in the legitimate machinery of commerce.

It is therefore natural that philanthropists, educators and missionary leaders should exert considerable influence in moulding our policy towards this country. They are prominent in every Far Eastern gathering where their views command attention. It is also fair to say that our millionaires are more interested in their charities and endowments than in trade or Chinese bonds, and it is easier to raise a million for establishing a college or a hospital than a hundred thousand for industrial development. It is quite possible, we have not the figures, that the aggregate property valuation of all missions, educational institutions, hospitals, and allied work exceed that of private American property. The valuation of the lands, buildings and equipment of the Rockefeller medical schools is nearly $8,000,000 gold. This important element has behind it the vast church organizations and if necessary, can exert a political pressure on Washington for the protection of its combined interests that no politician or statesmen would dare to ignore. A strong Chinese policy that would tend to open the eyes of Americans to the real state of China would materially affect the flow of voluntary contributions for general uplift work, undermine our principal industry in China and throw many Americans out of employment. The success of our major national undertaking in this country therefore depends upon the application of a policy of love, forgiveness and toleration of insults and violations of treaty rights. China's future depends entirely upon education and moral leadership and this can only be brought about by Christian universities. Every broad-minded man in the United States conversant with Chinese conditions agrees on this point, so our national policy must be shaped along lines that looks far into the future for any return on our capital outlay in trade profits.

Commenting on this policy. *The Central China Post* of Hankow, recently remarked :

" the love adventure has been tried, consistently and to the uttermost limit, by a large body of most devoted people but with most disastrous results. We mentioned the other day how 137 Protestant missionaries had been massacred in Shansi in Boxer year, and nearly all of them held the same views. Here is one story :—

" During those troubles several families in that province remained unaccounted for. It was hoped they had been able to hide themselves so trustworthy Chinese, well supplied with money, were sent from this port to try and find them and help them out. Two of these messengers, a little way north of the Yellow river, one morning met a cart coming south in which there was one party, consisting of a missionary, his wife and two lady missionaries, who told them to keep on and go after another missing man. A little later, two men on horseback, armed with swords, passed them whom they took to be Boxers in pursuit of the cart. They therefore turned back and had not gone far before they found the bodies of the four missionaries tipped out on the road with their throats cut. It seems that when the Boxers overtook the cart they ordered the missionaries to dismount, and as they refused the murderers climbed into the cart and cut their throats like so many sheep, after which the carter emptied the bodies out."

" We knew that missionary. He was a hefty Scotsman who with a stick could easily have driven the Boxers off swords and all, but the principle of love for the Chinese prevented him from making any move in self-defence. The tree is known by its fruits, and how fruits of this kind can be commended is more than we can see."

That sturdy Scotsman who meekly bared his throat to the slaughter and made no effort to defend the lives of the women under his protection is a true type. Death for their religion is a goal welcomed by many fanatics whose sacrifices are heralded far and wide throughout the churches of Christendom, memorials erected in their honor, their lives and deeds chronicled in a hundred church publications and their martyrdom handed down to posterity.

But these glorious sacrifices are entirely incompatible with the aspirations of those equally sturdy missionaries who look forward to some reward in this world for life work of advancing civilization and their country's interest through commerce. If love is to direct the relations between America and China, then the virile trader must expect the policy to work out in the long run exactly as it did in 1900 and as it is doing right now.

On the other hand, we have the policy of the group so closely allied with Peking that its sense of pure Americanism has become subordinated to its stipends or its dream of Sino-American cooperation. This element has influenced the shaping of American policy towards China for the past several years, contributing largely to the creation of the present intolerable situation by fulsome catering to Chinese opinion.

* * *

There is still another small but very active element which advocates exclusive American intervention in the affairs of China. Typical of their arguments is the nation-wide appeal of Mr. J. B. Powell, one of the Lincheng captives, through the columns of the *Chicago Tribune*, intended also as a personal appeal to President Harding : Mr. Powell says :

" Although we have no direct evidence we all feel in our hearts that all elements which have been fighting the Peking government are secretly using us as a further club to gain their private and selfish ends. Unless something is done we are likely to be held in these mountains for months until the whole country is unified and the politicians and militarists attain their selfish ends."

This undoubtedly, is a true explanation of the forces at work behind the long drawn out negotiatations and quite incompatible with his further deduction that

" without question international forces are a work here, which may throw China's four hundred millions into anarchy or a condition worse than that which now exists in Russia."

" These bandits as well as most of China's armies are armed with munitions supplied largely from the outside by foreign interests antagonistic to America—antagonistic because of our position of wealth, but, of more importance, antagonistic because of our democratic ideals and institutions which they do not like, which they hate, because the American idea of government by the people and for the people is spreading throughout the world and making imperialism a dangerous game everywhere."

" America took the lead in trying to settle China's external troubles at the Washington conference. *She forced Japan to return Shantung.* She has stood for the political, territorial and administrative integrity of China. America can come into China now with clean hands and help the right-minded members of China's population along the paths of advancement and world peace. America has gained the right to step in now and save China from-- what ? "

It is difficult to understand just what is meant by international forces working in China to throw the country into anarchy and why most of China's armies should be equipped with arms and munitions by nations antagonistic to America and the spread of democratic ideals. The inference is either that the Soviet or Japan is behind the movement, and if the former, there is ample evidence to substantiate this surmise. There is no ground, however, for implicating Japan simply because some Japanese rifles are found in the hands of the bandits, any more than there is to assume that Italy is stirring up trouble for America because her nationals have sold arms to China, or that Denmark and Sweden are deep in the conspiracy because their manufacturers have supplied Chang Tso-lin with the machinery for the largest arsenal in China. The Japanese rifles may have been legally purchased by the Chinese government for arming its troops. Application of the same logic would also involve Americans who contributed to the supply of arms and munitions by furnishing the machinery for the arsenal at Canton. As long as China maintains several well-equipped arsenals manufacturing munitions and individuals can be found to smuggle military supplies into the country, these infractions of the arms embargo, will continue without reference to America's ideals or position of wealth. The attempt to make it appear that the bandits are armed by foreigners influenced by hatred of America and American institutions is fanatical and far-fetched and only helps to becloud the real issue. Banditry in China has no relation to any outside influence except insofar as it may be connected with the spread of Soviet doctrines and even in this, there is little evidence to connect the two unless we admit that the Soviet teachings are much more wide-spread in China than we have been led to believe. If such a connection can be proved to exist then the time is not far distant when foreigners in this country may expect the worst and can prepare to pack up and depart while there is yet time. It must not be overlooked that there exist vast stores of rifles and munitions in Siberia, left behind by the various allied nations and which are finding their way into China through gun-runners who are not Russian or Japanese. As a matter of fact, the present chaos and utter disregard for the rights of foreigners has its roots firmly embedded in purely local conditions growing out of the spread of militarism having no relation to international forces. Once we touch upon the working of international forces in China all the great powers become equally involved and it would be just as easy to prove that British and American moral support to Wu Pei-fu or Sun Yat-sen is as much responsible for unsettled political conditions as alleged Japanese support to Chang Tso-lin or Tuan Chi-jui. Foreign meddling in the internal affairs of China which led to the original anti-Japanese movement and boycott, the ousting of Tuan Chi-jui and the Chang Tso-lin cabinets, culminating in another anti-Japanese campaign and boycott engineered from Peking, is as much to blame for the present deplorable situation as any story that might be concocted to prove that any other power or powers were at the bottom of the Lincheng outrage.

Public opinion throughout the world and in China can never be brought to an intelligent understanding of the real situation so long as innuendo, baseless accusations, distortion and misrepresentation of facts are permitted to pass as news. Nor can anything be accomplished so long as a campaign is carried on to make America the sole guardian of China, which, because of our lack of administrators familiar with the country, its peoples, their habits and customs, would resolve itself into a close corporation directed or advised by the advocates of the policy of love who for the past eight years have urged our taking over China's foreign obligations to the allies in part payment of their debt to us and defending her by force of arms. Under the guidance of this group, it would not be long before the United States would be railroaded into a war with Japan or some other power.

Nor can anything be accomplished by exclusive Anglo-American or Anglo-French American co-operation. The people of the United States would never consent to doing in Asia what they refused to do in Mexico, nor will the other powers sit quietly by and watch the extension of our Monroe doctrine across the Pacific by exclusive American intervention in the affairs of China, unless they were anxious to see us involved to an extent that we would become convinced that our place was at home—in Mexico and other Latin American countries which have defied Europe with impunity under the protecting wing of the Monroe doctrine. If the powers are really desirous of teaching us such a lesson, we may then conceive that they might acquiesce in our exclusive intervention in the affairs of China, or, if they desired to make us "lose face" with the Chinese, this is exactly the way they would go about it. For, it stands to reason that any one power which might send its troops to China and assume direction of the government in order to stabilize conditions, would be subjected to the same grilling propaganda as was formerly directed against Japan, when it was thought she might dominate the country. For the first few months perhaps, foreign opinion would warmly support exclusive American control, but as soon as the danger is past and it comes to reconstruction, every other national interest would have the knife as deep into us as they had it into Japan.

However, we will never get anywhere with all these conflicting opinions. In order to arrive at a definite program of sufficient efficacy some concrete idea such as proposed by the *North-China Daily News* must be accepted by all foreign interests as a basis for unanimous support. The handful of American and British troops now stationed throughout China is wholly inadequate to inspire the war-lords with respect for the object of their presence in the accessible treaty ports and provincial capitals. If a show of force is deemed essential to compel the *tuchuns* to compromise on a representative government, it will require more men than the scanty forces now stationed in North China. International intervention along these lines has never been successful wherever applied, and it would not be a success in China. The first thing to establish in China is a government by unification and then to do everything possible to help that government to function through constructive loans advanced by the consortium.

Dr. Sun Yat-sen may or may not be the man to lead a united China, but aside altogether from any question of his fitness, he is right when he says that the first step towards unification is the withdrawal of foreign recognition and support to the puppets of Wu Pei-fu. With the severance of diplomatic relations with Peking, it will not take long for the *tuchuns* to find some basis of compromise that will lead to a unified government that the powers can deal with. Until we have such a government all talk of reprisals, progressive indemnities and coercive measures is meaningless. America, Great Britain, France and Japan acting together in complete harmony can restore normal conditions in China. It cannot be done by any one foreign power or any combination of powers excluding Japan or by boosting any one war-lord because of his friendship for America and Great Britain or his leanings toward Japan. Continued recognition and support to Wu Pei-fu means an indefinite prolongation of civil war in China, the enrollment of new armies, the spread of banditry and further loss of foreign lives. When outrages upon foreigners are permitted to occur in the territory overrun by Wu's crack divisions and no attempt is made to suppress the bandit plague, can we hope for better conditions as other provinces are invaded and occupied by the same undisciplined hordes? If the foreign powers continue to recognize and support a faction whose dictator boasts that he will not rest until the country is unified by the sword, then all we have to say is that any American or Briton who takes his chance in the interior after Lincheng, does so with his eyes full open. If he pays the penalty, he will go to his death with the knowledge that he is a victim of the policy of love which has placed a halo around the head of the Wu Pei-fu and acquiesces in any outrages committed under his jurisdiction as necessary to the triumph of the "Savior of China." Let there be an end to international jealousies and a coming together of all powers in some constructive program which will compel unification without further civil strife. Let the Chinese settle their political differences in their own way and compromise on a leader and then let foreigners keep their hands off while a new system of government is being hammered into shape. This can only be brought about by strict neutrality and withdrawal of support and recognition to any one faction.

The Silence of the Samurai

A Contrast

IT was to be expected that the dyed-in-the-wool anti-Japanese element would seek to throw the blame for the Lincheng outrage upon Japan, either directly, or indirectly, through the Anfu party or Chang Tso-lin's agents alleged to be in her pay. The original story from Pao Tsu-ku that the bandits were mainly armed with rifles bearing Japanese marks provided the key-note for the flood of stories which followed. No Japanese were aboard the train when it was captured: *ergo*, the Japanese were warned beforehand by their consuls; the Japanese militarists in league with the Anfu clique instigated the outrage in order to discredit the Wu Pei-fu government: Liang Shih-yi and Yeh Kung-cho from the safe confines of Hongkong—enemies of the present Peking cabinet and friendly to Japan—prepared the plot: international forces (meaning Japan) are at work to plunge China into chaos and precipitate intervention: Japan's seeming indifference to the fate of the prisoners is evidence that she has something up her sleeve : America is getting too strong in China, hence Japan is arming the bandits in order to undermine American influence, etc. etc. etc.

Let us admit for the sake of argument (although there is not the slightest evidence on which to base the assumption) that some Japanese adventurers may have been mixed up in some way with the Lincheng affair. That does not implicate the Japanese government or the Japanese militarists any more than the American government can be held responsible for the acts of its citizens found participating in nearly every Latin-American revolution as leaders, soldiers, gun-runners or sitting in the background as financiers. As a matter of fact, American filibustering and meddling with the internal affairs of Latin-America is accepted as quite the proper thing. Historical works, novels and moving pictures galore immortalize these high-minded soldiers of fortune spreading the American idea of fair play and political principles. In each and every case they are heroes.

At the present time, American, British, Japanese and other foreign soldiers of fortune are to be found in the armies of Wu Pei-fu, Chang Tso-lin and Sun Yat-sen (only recently one of Chang's emmissaries was in Manila on a recruiting mission) but they are there in the full exercise of their individual rights as private citizens over whose actions their governments have absolutely no control. Even if Japanese adventurers are found in the ranks of the Shantung and Honan bandits and these gentry are armed in part with Japanese-made rifles, the Japanese government or its military authorities cannot be held responsible any more than the American government can be called to account for the activities of its citizens prominent in nearly every Latin-American upheaval. Has not the Chinese government purchased large quantities of rifles from Japan in the past decade? Who will say that the Japanese arms carried by the Linchang bandits were not part of these official importations, or who will dare assert that contraband arms traffic is an exclusive monopoly of any one set of nationals? Unless our information is grossly misleading, the most recent gun-running activities were carried out by Americans.

Many bad American *hombres* are enrolled in the outlaw gangs of Mexico : there are equally bad subjects of Japan to be found amongst the Hunghutzes that scourge Manchuria and Mongolia, though it may well be, that some of these men have been detailed by the Japanese army authorities to this dangerous life. We have personal knowledge of Americans who enlisted in Latin-American bandit or revolutionary bands—there is no difference between them—in order that accurate information of their movements and plans might be communicated to our military intelligence system. These things are done, but the man detailed to such hazardous work must accept the consequences without calling on his government for protection if captured. Before the law he is a bandit. If caught, he pays the penalty for his patriotism, exactly the same as a military intelligence officer when captured by the enemy in war-time.

However, Japan is not interested in stirring up strife in China or in taking sides with any one faction or of bringing about foreign armed intervention. Her actions have proved this. She honestly desires and is willing to sacrifice much for peace, harmony, co-operation and friendly trade relations with her big neighbor, and to prove her sincerity is exhibiting a patience no western people are capable of under such severe provocation. Japan has her Coltman cases by the score in Manchuria ; she has seen her people murdered, plundered and carried off for ransom ; her officials insulted and shot down by the Chinese authorities and the Hunghustzes ; in fact, she has passed through exactly the same experience in Manchuria and Mongolia that America did in Mexico, and aside from the parallel case where she sent her troops into Chientao, has refrained from any punitive expedition which might be interpreted as a cloak to hide imperialistic designs. In the aggregate, Japanese have suffered more at the hands of the Chinese than all other foreigners combined and should her nationals set up the same clamor for armed intervention heard on all sides from Americans and Britons over the Lincheng incident, she would be equally justified in acting on her own initiative by dispatching an army to occupy treaty ports and provincial capitals until indemnities are exacted and guarantees forthcoming that her subjects will be protected in their treaty rights. If the occupation of Northern Saghalien by Japanese troops pending a settlement of the Nicolaievsk massacre is excusable, then events could be made to equally justify similar action in this country.

Japan has many grievances against China but even under the most powerful incentives, is refraining from any act which might develop into armed intervention. How long her patience will hold is problematical, but for the present she staunchly upholds the principle of non-intervention, lending the weight of her influence against sending foreign troops into Shantung to liberate the Lincheng captives. Japan is adhering strictly to the example set by the United States in her treatment of Mexico, refusing to use force on a weaker neighbor whose government has been destroyed and usurped by bandits and military dictators. Whether such a policy is justified or not is difficult to say, but as far as America is concerned, instead of creating an enemy of her neighbor and incurring the suspicion of every Latin-American country, we retain their friendship and confidence. It required a strong will to withstand the powerful pressure of an outraged public opinion clamoring for punitive expeditions, seizure of ports and custom houses as guarantees that American lives and properties would be respected, but rightly or wrongly, the administration pursued its policy of watchful waiting during a period of world upheaval and now that a stable government is again in power, Mexico will be called upon to square accounts in a peaceful manner. The United States has not lost the friendship of Latin-America. Our example during those years of extreme provocation acted as a deterrent upon Japan, and had we gone into Mexico on the wave of popular clamor, the old Japanese military party would have found sufficient pretexts for applying similar pressure upon China. China is intact to-day because President Wilson laid down a precedent in international morality that Japan closely followed and with a change of policy and cabinets, Japan is now determined by all peaceful means consistent with her honor and dignity to regain the confidence of China.

To Japan's many grievances against China is now added a violent and wholly irrational boycott set in motion by the students over the Kwantung lease. Starting in Peking with the connivance of the authorities, backed by Wu Pei-fu who instructed the *tuchun* of Hupeh not to oppose " the will of the people," the movement has made rapid headway in the upper Yangtze ports. At Ichang, the students attempted to prevent the unloading of freight from a Japanese steamer, calling for the landing of marines from a Japanese gunboat. The same scenes were enacted in Shasi while in Hankow every method of insulting the Japanese was adopted. In carrying out the same tactics in Changsha the marines from a Japanese warship were landed to protect their nationals. Assailed by a shower of stones the marines fired into the crowd killing three and wounding others. The Peking government which made no effort to interfere with the " will of the people " immediately lodged a protest with Tokyo demanding apologies and indemnities. So here we have another major incident between China and Japan on a par with Lincheng. If the latter calls for exclusive American and British intervention, Changsha may likewise call for separate action on the part of Japan.

Japan has meekly submitted for the past several years to the most bitter and unfair propaganda the world has ever witnessed, a propaganda directed and paid for by the Peking government having for its object the discrediting and isolation of Japan and of inciting hostilities with America. The original Japanese boycott with its aftermath of anti-Japanese activities ; the campaign against the Anglo-Japanese alliance ; the recent movement and boycott can all be traced to the initiative and direction of individuals in the pay of the Peking government. During the past month the British government has protested vigorously to Moscow and threatened reprisals if the Bolschevist propaganda in Afghanistan is not discontinued forthwith. We have yet to learn that Japan has presented any official protest to Peking against a propaganda carried on with its full approval by paid advisers or that she has threatened reprisals.

At the bottom of the present boycott and student agitation is Japan's refusal to surrender the Liaotung peninsula at the expiration of the original lease to Russia expiring in March of this year, standing on the validity of the 1915 tresty which China denounces as null and void. In answer to China's note demanding the return of the territory, instead of ignoring its contents, Japan explained her position at considerable length, intentionally refraining from opening old sores by digging up past history which would injure China in the eyes of the world.

Japan made no mention in her reply to the existence of China's secret alliance of 1896 with Russia which brought on the war of 1904-05 : she refrained from inviting attention to the weighty fact that China was a full ally of Russia during the progress of the war: that the terms of the alliance were maintained in such profound secrecy that at Portsmouth China escaped paying her full share of the indemnity and even had her sovereignty restored over the lost three eastern provinces. Japan did not mention the terrible sacrifice she was compelled to make for China's perfidy or the subsequent burdens imposed upon her people in order to be constantly prepared to meet Russia's program for a war of revenge. Japan did not remind China that she came out of the war as the real beneficiary, in fact, with great self-control the Japanese government declined to make public her full case against China. Whatever the reason for this silence, Japan once more placed on record her desire to remain on cordial terms with her neighbor. Other powers bent on aggression, with much less provocation would have accepted China's note as a challenge, severed diplomatic relations forthwith and prepared for hostilities. Had Japan done this and placed her full case before the world, going back to the causes which compelled her to re-enter Kwantung, and the price she paid for China's intrigues with Russia, public opinion would have supported and applauded her position.

Maintained in complete ignorance of these basic facts, the Chinese could not recognize the magnanimity of Japan's conduct and initiated another boycott in retaliation. Curiously enough, however, it is a boycott which works one way only. Chinese merchants refuse to purchase or display Japanese goods but are only glad to sell their products to Japan. If Japan should retaliate by boycotting Chinese raw materials and purchase her requirements in other markets, the shoe would be on the other foot. Perhaps this attitude of China is one reason why Japan is anxious to resume trade relations with Russia which may lead to other far-reaching understandings in regard to their political rights in Eastern Asia.

The attitude of Japan towards China since the Paris peace conference has been consistent, open, honorable and sympathetic. She has sacrificed her advantages and surrendered her special privileges, standing squarely on the doctrine of equal opportunity and respect for the sovereignty of China, while Russia has again annexed Mongolia, closed the door to other nations and is fortifying her position against another forward movement. Not a word is heard about Russian aggression. Chinese and Russians fraternize, inter-marry and are great comrades. Yet after all that has gone before, China asks Japan to get out of Kwantung and surrender the one strategic guarantee for their mutual safety in these regions. Because Japan declines to be moved by sentiment and insists upon protecting her vital interests, the boycott machinery is set in motion to destroy her trade and make impossible the presence of her nationals in the interior. The fat is now in the fire over the Changsha incident, yet we hear no roar for armed intervention from Japanese subjects, no demands that Japan take upon herself the exclusive task of restoring order or coercing the Peking government. There is nothing but the silence of the Samurai, the patience of a proud spirited fighting people secure in their strength and so sure of the justice of their position that they can afford to wait and watch in the certainty that time will justify their policies and convince the Chinese of the error of their ways.

The Tail of the Dog

Sidelights on the Origin and Impulses Behind the Opposition in China to American Co-operation with Japan

Responsibility for China's Reckless Disregard for Foreign Treaty Rights

Americans shall not co-operate with Japan: Americans shall not lend money to Japan: Americans at home shall not enter into any arrangement with Japanese that might conflict with the business of Americans in China.

Adherance to these commandments has been a fundamental essential to the good standing of Americans with their compatriots in China. If by any chance an American could be found who honestly held opposite views, or worse still, had the temerity to actually violate this law, he was singled out for punishment through business boycotts and libellous aspersions on his character and patriotism. It was easy enough under the last administration to establish and consolidate the rule of this minority and intimidate the majority into endorsing its opinions; the real anti-Japanese leaders were at that time placed in high positions and any fifty per cent. hyphenate could join in the procession and abuse the "traitors" who refused to tag along and engage in the merry pastime of throwing bricks at the Japanese. The tail then thought it was wagging the dog and the "Jap-slappers" screamed with glee at the wonderful exhibition of their political power. But the dog grew tired of being goaded into a fight with Japan. The anti-Japanese statesmen of the Wilson regimé gave place to a new trinity of brains which insisted upon doing its own thinking and communicating its will to the caudal appendage. The tail no longer moves the dog. Independent Americans at home have rebelled against the system of intimidation directed from Peking and Shanghai demanding unconditional allegiance to China in all international questions, thrown overboard the professional agitators and paid trouble-makers and put an end to their favorite indoor sport of hammering Japan.

One prominent Far Eastern society noted in the past for its anti-Japanese propaganda has emancipated itself from the domination of the Chinafied-American clique and intends to run its affairs in the future on a solid American platform. The tables are being turned. The war-yappers of three years ago are now charged with being unpatriotic. Congressman Leonidas Dyer has delivered another speech, this time before the foreign trade board of the Seattle chamber of commerce in which he scathingly denounced those American papers and Americans showing an unfriendly attitude towards Japan, as "*traitors to the United States.*" Although there have been signs that these rumblings had been heard in China, recent occurrences indicate that the tail still cherishes the illusion that it retains its power to wag the dog.

This anomalous situation was accentuated by the commotion raised in China over the National City Bank loan to the Japanese Oriental Development Company. The interpretation placed on the American motives in negotiating the loan by the leading foreign mouthpiece of the Peking authorities, constituted a direct insult to the American government and our bankers, and, taken in connection with the equally grave accusation against the American group, and by innuendo, the state department, contained in a Shanghai newspaper comment on the same loan, should be of sufficient importance to lead thoughtful Americans to inquire into the origins and motives of a campaign, which, on analysis, tends towards the monopolization of American financial co-operation in the Far East in just one direction. Instead of any motion being made to condemn these aspersions on the good-faith of the American government or its financial instruments in carrying out its policy in China, we find Americans endorsing the insult in resolutions strengthening the hands of the professional trouble-makers by reiterating the doctrine that all American loans should be made through purely American firms and carry the proviso that all materials be purchased in America. This basic doctrine already guides our state department and financiers in every case where the principle can be safely applied. In view, however, of the tendency of our bankers to follow the pre-war precedent of France in lending money to foreign governments and enterprises without adequate protection to the basic industries of the nation, the reiteration of the principle at this time was not wholly unwarranted. Such resolutions may not be directly aimed at the National City Bank, but the negotiation of the Oriental Development loan forced their passage with the hope it would be taken as a warning against the flotation of other similar loans for the development of Japanese enterprises on the Asiatic mainland.

The American papers of April 28 corroborate our own information that the protests against American loans to Japanese companies originated in the American chamber of commerce at Harbin and although it is understood that such resolutions are not for publication, we find they were telegraphed through the associated press service to the United States. The Harbin chamber not only remonstrated against the National City loan to the Oriental Development Company, but cabled a further protest to Washington against the granting of a $10,000,000 loan to the South Manchuria Railway Company because it would "be inimical to the open door in Manchuria and Mongolia." We make just one observation on this attitude. The protest of the Harbin American chamber of commerce was telegraphed to the American press on April 27. On April 29, the leading newspapers in the country printed the official summary of the protocol signed on February 22 between the representatives of Moscow and Urga, which for all practical purposes annexes Outer Mongolia to Moscow, and hands over to Russians a monopoly of its trade. Yet Americans doing business in Harbin raged, tore their hair and invited their compatriots in other parts of China to rage with them over an American loan to the Japanese which *might* be inimical to the open door, while their Bolshevist friends kick them out of Mongolia bag and baggage. Americans in China lose sight of the fact that international recognition of Mongolia as an integral part of the Chinese republic is one of the cardinal principles rigorously imposed in the consortium pact in order to exclude Japan from any special or preferential rights in these regions. Under these conditions, or until Americans in Harbin and elsewhere in China, protest against the dismemberment of China by Russian occupation of any part of Mongolia, they are exposing themselves to the grave charge of inciting hatred against Japan and of aiding and abetting a movement which in the end will place Russia in a favorable position to attack Japan on her unguarded flank and pave the way for the complete realization of the Soviet dream in Eastern Asia. Not a word was heard about the implied insult to the state department or our financiers ; not a thought given to recent treaties or understandings which brings Japan in line with America on all questions affecting China ; not a note of warning on the direful consequences of Russia's re-occupation of Mongolia and the possibility of another war in that quarter of the world in which Japan will have to fight for her national existence ; no recollection that British loans to Japan established her position in Manchuria by the reconstruction of the South Manchuria Railway; no recognition of the fact that it was Japanese money, brains and enterprise which developed Manchuria and made it the foremost market for American materials in Asia : all these are overlooked in a blind, unreasoning antagonism to Japan and a sentimental friendship for the Soviet, which, when the times arrives to show its hand, will reward Americans in the same manner as it has treated other traders who have consented to be its catspaws. This may be good Americanism, but it is out of date.

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The stream of gold flowing into the United States from abroad added to the huge surplus derived from home investments, sooner or later, must create a situation where bond-buyers will be less and less influenced by patriotic impulses. There is little patriotism at any time to capital in the mass when seeking profits, and the natural tendency in the future will be towards negotiating foreign loans or purchasing the bonds of foreign enterprises strictly on their merits as income producers. It will be as difficult in America as it formerly was in England and France to enforce the purchase of materials in a loan agreement which otherwise might be a most desirable investment. Experience teaches us that without stringent governmental supervision over foreign loans, the investor will react favorably towards those bonds which gives the highest guaranteed returns. It is not essential that these guarantees be endorsed by the state department or that the loan itself receive its sanction, as experience has taught the American investor that official support to a foreign loan carries no obligation on the part of the government to protect his investment.

This tendency of human nature, both in England and France, led to a very formidable movement on the part of the manufacturers in both countries to have inserted in all future foreign industrial and development loans, a clause providing for preference to British and French materials. The latter, especially, were exceedingly wroth over the fact that the Chinese railways had been financed up to fifty per cent. and over by French bondholders, while the industries of the nation had not benefited one *sou* by the purchase of their products. It was not that the French bankers were unpatriotic, but that France itself had reached that pinnacle of prosperity where it became difficult to reinvest the annual increment that rolled into her coffers from all parts of the world in enterprises that would benefit her manufacturing industries. To such an extent was it necessary for France to find profitable outlets for her surplus capital, that banking superceded manufacturing as the chief industry of the nation. Under such conditions, it was not always judicious to hold out for the purchase of French materials and defeat a profitable loan transaction for the benefit of the major national industry.

The same conditions may be said to exist in the United States. It is now most difficult to profitably reinvest all our great wealth at home and with the yearly accumulation of capital America will be handicapped to find acceptable outlets abroad if every loan agreement is to embrace provisions for the purchase of American equipment. Furthermore, if other nations are to pay their war and other debts in gold and in each new accommodation obliged to purchase American materials, their power of recuperation and ability to repay will become more and more circumscribed. The principle that American loans shall be made exclusively through American firms and carry with them the purchase of our materials, is fundamentally sound, but extremely difficult to apply. Insistence upon this point must inevitably lead to connivance on the part of bond-buyers with the borrowers to evade the principle and if governmental supervision becomes so strict as to keep such issues off the open market, the loans will be made by private subscription and without governmental support. If the bonds cannot be purchased in the American market they will be subscribed for and held abroad by the agents of the investors. In other words, we cannot have our cake and eat it too ; we cannot garner the profits coming and going. If the accumulation of gold becomes so great that it cannot find profitable employment at home, it must be sent abroad ; in which case, occasions will arise where such investments must stand squarely on their own merits without provisions for purchasing American equipment and without the official support of the government.

In backward or non-manufacturing countries, the principle should be applied as far as possible, but at the same time, we should first make certain that our government will actively protect the bond-holder in case of default. In the case of China, there is no guarantee to the American investor that his government will support him in taking forcible steps to foreclose on the security in the event of default or repudiation while the extension of this policy to other nations has acted as a deterrent in protecting their Chinese investments. One of the principal appeals of the consortium to American bankers is the implied assurance that its loans to China will be guaranteed by a combination of four powers : eliminate this international guarantee and there is no inducement for the American investor to purchase Chinese government bonds. American money will not flow into China under present conditions unless sufficiently protected, hence, there is every good reason why the investor should subscribe to a bond fully guaranteed as to principal and interest by the Japanese, British, or any other government, a guarantee that his own government cannot be expected to give. Once we accept the signature of Japan to a solemn treaty affirming that she has no special rights in China, that she stands squarely on the principle of equal opportunity and respect for the integrity and sovereignty of this country, a loan for the development of Manchuria guaranteed by the Japanese government, becomes one of the most desirable investments that could be offered to the public. The policy of American loans to China through exclusive American firms or through the consortium is apparently losing favor even in official American circles, as we are informed through the Asiatic News Agency under date of June 1, that the American commercial attaché at Peking has invited the Chinese bankers' association and prominent business-men to send representatives to the United States to establish connections with American bankers and business-men who are interested in the development of China's resources. This invitation, we are informed, is now under the careful consideration of the Chinese bankers, who have been led to believe that there are twenty or thirty million gold dollars available from American investors for the successful development of agricultural and industrial resources of the three Manchurian provinces as well as in certain parts of China proper through Sino-American or Sino-American-Japanese co-operation in the future. "Manchuria is

Chinese territory, but it is believed no important industry can be successfully developed there without Japanese co-operation." No matter what may be behind this piece of news, it indicates that the commerce department does not endorse the exclusive principle of American loans through American concerns. If such a course is desirable, then the question of guarantees remains as strong as ever, as Sino-American co-operation for the development of Manchuria will carry little weight with the investor unless participation is extended to Japan. This triangular working arrangement is a very worthy and sensible one.

It will be seen, therefore, that although the principle of American loans through American firms accompanied with suitable guarantees is fundamentally sound, there exist conditions which militate against its application in all instances, and in view of the sentiment against co-operation with Japan, Americans should be extremely careful to avoid converting the doctrine into a unilateral working agreement which deprives all countries other than Great Britain of the benefit arising from our co-operation.

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For this is exactly how the doctrine is working out in its application to China. American co-operation with Japan is loudly condemned by the policy-makers of Peking and Shanghai, yet a little investigation will disclose that the opposition in large part can be traced to Americans so closely identified with British enterprises that it is difficult to determine where the interests of one begins and the other ends. In making this statement we do not wish to be interpreted as being unfriendly to Anglo-American co-operation. Far from it. We hold that the best interests of both peoples and of the world at large will be materially benefitted by the closest understanding between America and Great Britain. Co-operation between these two great nations is the natural outcome to the ties of blood, language and ideals which bind them together, and though at times their material interests may come into conflict, in the end both people can be depended upon to settle their differences with a hearty hand shake. Anglo-American co-operation has been brought to its present working perfection through close commercial relations and joint business responsibilities. It is only by doing business with a man that we learn to understand, respect and make a friend of him.

America and Great Britain, the one a republic and the other an empire, can never arrive at a complete understanding on all world issues. The policies of both governments are based on diametrically opposed basic conditions and not until America reaches that stage in her national development where she must rely on foreign markets for her national existence, colonies for her surplus population and fields for the profitable investment of her surplus capital, will she be able to see eye to eye with Great Britain on larger world issues. British foreign policy is deeply rooted in the dire necessity of the nation to find markets for its manufactured products in order to assure its food supply, a necessity which precludes any undue manifestation of sentiment in dealing with backward peoples: America, self-sufficient and self-contained, faces no such vital problems and can view world affairs from a philanthropic standpoint and make concessions to ideals that would spell disaster for Great Britain. It will be many years before the masses of America fully appreciate and sympathize with the vital problems confronting the British in their struggle for existence. Notwithstanding this fundamental difference in their outlook on world affairs, business relations between the two peoples have become so intimate that the most cordial understanding and co-operation exists, but there are and always will be, occasions when the material interests of both nations will clash. It is to be hoped that such competition will always be friendly and the loser take his medicine like a good sport, and while this much to be desired result is possible at home amongst broad-minded leaders, it is difficult to expect it to prevail on the firing line of the great struggle for trade supremacy in Eastern Asia, where the merchants of both nations are in keen competition for the advancement of their respective national interests. Politically, Anglo-American co-operation in China is highly desirable and to a large extent this is also true of finance and business, but it is unwise to attempt to convert the principle into a doctrine which discriminates against other nations at a time when the whole world looks to America for financial relief.

Anglo-American business co-operation in China is of such long standing that it cannot be uprooted even if such a movement was launched. American manufacturers in the past have been compelled to rely largely upon foreign concerns to act as their agents in this country, and even to-day, there are many British concerns successfully representing American manufacturers and loyally pushing the sale of their products. The limited number of purely American concerns in China equipped to represent American machinery manufacturers without taking up competing lines, still makes it necessary for foreign firms to handle our products. Such co-operation is most desirable and although it may not meet with unanimous American approval, existing conditions will compel the continuance of such methods until American manufacturers have their own offices and representatives on the ground. Although such co-operation in the past has in a large measure been Anglo-American, there are instances where Japanese firms have ably represented and pushed the sale of American products. If we take the case of the Mitsui Bussan Kaisha, representing the American Locomotive Company and other American railway specialties, it must be acknowledged that their success has been phenomenal, as every Japanese built or controlled railway in China is equipped throughout with American materials; the Japanese doing for our manufacturers what we were never able to do for ourselves. If Anglo-American co-operation in China guaged by the amount of business done, is so desirable, then the record set by Mitsui & Company is an unanswerable argument for closer Japanese-American co-operation, as their sales in American railway materials alone overtop in value the business of all other foreign agents of American manufacturers. Without advancing an argument against British representation of American manufacturers, it is our duty to point out that in the major lines of manufactured products, notably in the engineering trade, the British are our keenest and most formidable rivals, and in the past, have invariably insisted upon their own materials being specified and purchased for any railway or industrial enterprise carried out with their money. It is safe to say that American materials will never be purchased to equip any undertaking financed by the British. This is as it should be. Britain needs every export opportunity she can create; it is vital to her economic life.

On the other hand, experience has proven that in Japan, Korea, Formosa, Shantung, Manchuria, and in other parts of China where the Japanese have gone, they invariably favor American equipment, and although the orders may not be placed through American trading firms on the ground, our manufacturers reap the profits from the orders placed through Japanese firms in New York. In this respect, the Japanese have done more to advance American engineering practice in China and swell the value and volume of our imports than any other nation, yet we have never loaned them one cent for development purposes. In fact, our success is due in the first instance to a British loan to Japan for the South Manchuria Railway which they expended in the United States. At least $75,000,000 (gold) has been since expended by the South Manchuria Railway and its allied industrial concerns for American materials, equivalent to the total value of all foreign equipment supplied in the construction of Chinese government railways, in return for which, other nations had to furnish loans aggregating $150,000,000 gold. In other words, without advancing one cent, American manufacturers have benefitted through Japanese purchases of their products in Manchuria alone to the same extent as their European competitors who lent the funds to China to create a market for their products. What is true in Manchuria, is true in Korea, where the trunk railway has been Americanized and industries equipped with American machinery. It was true in Shantung under Japanese occupation for out of $10,000,000 expended for railway material, about $4,000,000 went for American equipment. Had the Japanese finished the construction of the Kiangsi Railway, it would also have been equipped throughout according to American practice.

It is natural that American trading firms in China should view this situation with some concern, but investigation will doubtless reveal that in the majority of these cases, the Japanese have not unduly interfered with existing agency arrangements. Confining our remarks to the engineering trade, it is a physical impossibility for the limited number of American firms in China equipped to handle engineering business, to represent all the competing manufacturers at home. As it is, many of our foremost manufacturers are forced to remain out of the field, because of the great difficulty experienced in finding suitable representatives. If these manufacturers desire to enter the market they must either open their own office or entrust their interests to a foreign firm. Right here arises a very pertinent question. In view of what Japanese have already accomplished for American machinery manufacturers in China, and bearing in mind that there is little hope for the sale of our products to British financed undertakings, is it fair to single out the Japanese for discrimination and lay down and enforce the principle that only European firms can be trusted to handle American products in the absence of suitable American representation ? Unreasoning hostility and deep rooted prejudice may lead some Americans to answer in the affirmative, but such views will never be endorsed by the older and wiser heads directing the affairs of the nation. THE FAR EASTERN REVIEW upholds the doctrine that American goods in any country should, as far as possible, be sold through American firms, but until such time as all our manufacturers are adequately represented in China by Americans, many of them must do business through other channels, and we hold that is highly discourteous and conducive to serious misunderstandings if we attempt to discriminate as to the nationality of such salesmen.

It is axiomatic that American goods can be best marketed in China through American organizations in the field, staffed with an American personnel, and we agree heartily with the principle that our manufacturers and merchants should send their big men to China rather than the men they can most easily spare, but we hold that no boom trade campaign can ever accomplish this much-to-be-desired result. As will be referred to later on, it was this regrettable handling of one of the most vital policies for the advancement of American trade in China, which brought ruin to the large number of American firms who swarmed into this country at the call of the booster and precipitated a general financial catastrophe from which China firms have never recovered. The result is that many of our manufacturers are now without proper representation, and unless they utilize foreign firms they must stay out of the market or open their own office.

A good rule should work both ways and if American loans and American products are to be made and sold through exclusive American representation, then trade with the United States should be reciprocal. Exports of Chinese products to America for the first three months of 1923 show that only 35 per cent. of the total valuation passed through American firms, while 48½ per cent. of the total was carried in American vessels. If all our exports to China are sold through American firms then all our imports should pass through the same channels, for the ruling to be ideal. The above figures show that we are a long way from this goal, and if the same proportion of the total exists in our exportations to China, it is certainly most unwise to lay down any principles that may invoke reprisals and damage our growing trade with this part of the world.

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Anglo-American co-operation in China received its impetus during the war when Japanese loan activities in Peking became so alarming that this alliance assumed a political character in the organization of an association whose activities were marked by the most violent anti-Japanese propaganda. As this movement had the endorsement of British and American officials, its program was accepted and carried out by the nationals of both countries as a patriotic duty. Notwithstanding, however, that conditions have since changed and Japan is now working in complete accord and harmony with America and Britain for the solution of Pacific and Far Eastern problems, the ill-feeling engendered three and four years ago still smoulders and the same leaders continue to influence American and foreign opinion against accepting Japan as a working partner. The anti-Japanese campaign in America is dead and cannot be resurrected. Only in China is the agitation against co-operation with Japan still being carried on, and, as we have indicated, the leaders of this movement are Americans so closely identified with other national interests, that it gives rise to the suspicion that the doctrine of co-operation is one which can be applied only in one direction.

We do not wish to imply by this that official British sentiment or their important financial or commercial firms are responsible for this anti-Japanese attitude, though it is easy to prove in specific instances that British publicists in the employ of the Chinese government encourage the movement by their continued opposition to Japan. Neither do we wish to enter into personalities and question or challenge the motives of or wound the susceptibilities of Anglo-American leaders of American opinion and trade. We simply desire to invite attention to and emphasize that the principle of American co-operation is being distorted in its application into a discriminatory doctrine, most unfair and un-American in its one-sided operation.

Our observations convince us that these Americans so closely allied with British enterprises are foremost in advocating the doctrine of American loans to China exclusively through American firms, but it is safe to assume that the restriction is not intended to cover or interfere with their own operations. This statement is not made to impugn the good faith of these international traders but to prove that their attitude tends to defeat American co-operation with any nation other than Great Britain, and when, as is the case at present, Japan is singled out for discrimination, their position becomes opposed to all ethics of international goodwill and to the higher interests of their own country.

If Americans with close British affiliations are accepted as guiding spirits in the American business community in China, there is no good reason why equally patriotic citizens representing American manufacturers through the medium of other foreign firms, should not also be elected to head our national business and other associations. If success in the sale of American products is the measure of an American's qualification to direct American business associations in this country, there is no good reason why the representative of the American Locomotive Company working through the great Japanese firm of Mitsui, is not equally entitled to weild the same influence as an American working through or in partnership with a British, French, Chinese or Patagonian concern.

* * *

Working in close harmony with the most important leaders of American finance and industry, THE FAR EASTERN REVIEW has contributed as far as possible to a better understanding with Japan in order to avert hostilities and bring about co-operation through the consortium for the development of China. It was realized that the same spirit of friendly co-operation characterizing our business relations with Great Britain if extended to Japan would contribute more towards the cause of peace and good understanding in the Pacific and the expansion of American trade in the Far East generally, than any other single program, a sentiment that was heartily endorsed and accepted by the big business-man of Japan. The same close business associations which bind together America and Great Britain in ties which make impossible any serious break in their relations, if applied to Japan will bring about the same beneficial results.

It was also sensed that American money would never be invested in China in large sums while disorder prevailed and guarantees were lacking, or while there was a possibility of war between China and Japan. It was believed that the basic condition to the floating of any large American loan for the development of China was an amicable adjustment of her outstanding questions with Japan in order to clear the way for an era of perfect peace in the Orient. THE FAR EASTERN REVIEW has accepted these ideas as a cardinal feature of American policy, but in presenting them, we have met at every turn the uncompromising opposition of a group so deeply committed to Anglo-American co-operation or so closely wedded to the Chinese that it can no longer approach these broad questions from a disinterested American viewpoint.

To such an extent has this *liaison* been carried, that American initiative in support of American policies has been practically eliminated in the so-called exponents of American opinion in China. Evidence in support of this statement is seen in the following editorial note preceding an article on the American loan to the Japanese Oriental Development Company published in a local American organ and which we commented on in our May number :—

" *Note.—This article from the Commercial and Financial Chronicial of New York gives full details regarding the loan of the National City Bank of New York to the Japanese Oriental Development Corporation which has attracted so much attention in Chinese and foreign circles in China and in several cases has produced condemnatory resolutions on the part of both Chinese and foreign chambers of commerce. The apprehension is due to the fear in China that this loan is the beginning of a financial policy on the part of* (*a*) *certain American banking group to lend money to Japan for purposes of* *furthering Japanese imperialistic projects on the continent of Asia. Considerable apprehension has also been aroused in American commercial circles for fear that this policy might be detrimental to American commercial interests in China.*"

It is difficult to believe that any hundred per cent. American with a full knowledge of recent history, could be sincerely apprehensive that the American group in the consortium working at all times in full accord with the state department, would lend money to Japan for the purpose of furthering her imperialistic projects on the continent of Asia, especially at this date when Japan has surrendered her special advantages and is co-operating with the United States for the carrying out of principles incorporated into the Washington treaties. The expression of such a thought however disguised, constitutes an insult to the intelligence and good-faith of the state department and our banking group and when read by young Chinese students is accepted as proof of American double-dealing. When Chinese confidence in the good-faith of America is destroyed by the circulation of such baseless accusations, we must not be surprised if an impetus is given to the present anti-foreign movement throughout all parts of this country.

We are patriotic enough to believe that after the events of the past four years our financiers and statesmen can be depended upon to fully protect Chinese interests and adhere faithfully to the provisions of the Washington treaties, and we have equal faith in the sincerity of the present Japanese government to live up to its solemn committments. If Americans in China are to be apprehensive that the acts of their own government and financiers will prove detrimental to American commercial interests in this country, then the facts herein disclosed may influence Americans at home to be equally suspicious of the motives which doubts their sincerity and judgement. If these attacks upon the integrity of Americans who hold views opposed to those of the wholly Chinafied-Anglo-American group continue, the time may well arrive when our leaders may have something to say in their own behalf.

These aspersions upon the loyalty of Americans who differ with the dominant faction in China would not be tolerated in the United States and their employment provides additional evidence of its close understanding with the Peking publicity system.

We have before us an editorial entitled "The Consortium and Manchuria" from the *Far Eastern Times* of May 15, a Peking newspaper directed by one of the British high advisers to the Chinese government, the same gentleman who played upon American sentiment and drew up the secret alliance and plan of campaign that was to hold the gulf of Chihli and the approaches to Peking pending *American mobilization* in the war that was to have been precipitated between America and Japan: the same gentleman who publicly accused J. P. Morgan & Company with sharp practice in purchasing the German Hukwang bonds after China declared war upon Germany, and in attempting to blackmail the Chinese government into recognizing and paying the interest on these bonds as a condition to any loan from the consortium. The editorial in question is another undignified attack on the good faith of the American group and the state department in the matter of the National City loan to the Oriental Development Company, accusing Mr. Lamont of having entered into a "gentleman's agreement" in which the Japanese group retains its special position in Manchuria and the American group is keeping out, a secret understanding "in which one side saves its face at the expense of a little prevarication whilst the other saves some tangible asset at a like cost."

The writer bases his accusation on the fact that the Japanese are paying an extra one per cent. interest to the American bankers over and above the 5½ per cent. basis of the long-term Japanese obligations floated in England. No consideration is given to the present state of the international money market and the peculiar conditions surrounding the flotation of any loan at this time in the United States. Now, it is altogether possible that the Japanese may have desired to float this loan in America and were willing to pay a higher interest rate for the purpose of encouraging further co-operation and breaking down the wall of prejudice erected by the propagandists of the Peking government. Had the Japanese government guaranteed the Oriental Development loan as to principal and interest and excluded foreign participation, then indeed there might be some ground for the suspicion that the proceeds were to be employed for the furtherance of imperialistic projects. The mere fact that it was issued in the United States bringing Americans into full partnership in the purposes of the loan, would indicate a most cordial desire to have us co-operate with them, an assurance to China that her interests will be fully safeguarded. To assume otherwise, is a gross slur on American goodfaith and a calumny against Japan.

This wholly unwarranted attack on the integrity of the American group, reflecting as it does on the honor of the state department, can only be considered in the light of a gratuitous insult to the United States.

When it is known that advisers to the Peking government are directing the campaign to destroy the consortium and Chinafied-Americans support the propaganda to discredit its American chairman and Peking representative, it is about time that real Americans sat up and took notice. The underhand attacks upon Mr. Frederick W. Stevens has probably resulted in the loss of one of the best qualified Americans ever selected to direct our financial transactions with the Chinese. There is little hope that he can be induced to return to a post where he cannot rely upon the trust and confidence of his own countrymen. When Americans acquiesce in these attacks on the honor of their government and the integrity of their financiers, they are making it more and more difficult to obtain the much needed funds for the rehabilitation and reconstruction of China, for it is hardly to be expected that the American group will be over-anxious to lend money to a government whose advisers and propagandists are constantly impugning its motives and business honor. Incidentally this is the thanks the American government receives for its continued recognition of the Wu Pei-fu cabinets.

* * *

We might go further and assert that the present deplorable condition in China is traceable largely to the stubborn opposition of the same Chinafied-American group to the publication of the facts surrounding the true state of affairs. Had the American people been told the truth in time, the outcome of the Washington conference would have been a different story as far as concessions to China were concerned. We speak with accurate knowledge when we say that severe pressure was brought to bear upon American writers who attempted to present the facts.

The concealment and distortion of facts concerning China amidst the welter of sentimental gush spread broadcast during a whirlwind campaign for Chinese-American co-operation and the enactment of the China trade act, created the atmosphere at Washington which resulted in concessions which are now recognized as being mainly responsible for the present utter disregard for foreign rights in this country.

Every movement initiated under the leadership of this group has brought disaster to foreign interests in China. Its activities in 1919 and 1920 were in such close harmony with the propaganda for bringing about a "show-down" with Japan that for all practical purposes their aims were identical. Nobody was fooled as to the meaning of the phrase so glibly bandied about; if it meant anything at all, it meant the creation of a situation where the United States would have to challenge Japan on behalf of China.

The same group is responsible for the campaign which terminated the Anglo-Japanese alliance exposing India to the menace of Bolshevism and making Britain's lot ten times harder to bear through the elimination of Japan as a factor in preserving the peace of Asia. Americans and Britons alike accepted the specious arguments of the group and in a frenzy of suspicion and hysteria, the Anglo-Japanese pact went into the discard. The result? Peace is assured in the Pacific, the integrity of China is guaranteed through the Washington treaties, but Britain in India once more faces alone the menace from the slow unceasing advance of Russia.

Freed from the pressure of Japan, the only power on earth feared by Russia, the Soviet is now pushing forward its plans to dominate India until the British government has threatened Moscow with reprisals if its propaganda in Afghanistan is not discontinued forthwith. It is only a few months since Soviet diplomacy and intrigues in Turkey brought disaster to Great Britain in the Near East and it was a foregone conclusion that Lenin would follow up the victory by striking at Britain's vulnerable bulwark in Afghanistan.

Britain is now concerned over the safety of her Asiatic empire; Mongolia is annexed to Moscow; the Soviet is strengthening its position in China and the only force in Asia which might serve as a barrier to further advances has been discredited through the propaganda of the group working from Peking and Shanghai. When the Russians are once more hammering at the gates of Herat and the thin Red Line is strung out in battle array along the northern borders of India, Britain can then thank those of her sons whose allegiance to China brought this calamity upon the empire by eliminating Japan from a partnership that would have operated as a check on Moscow. Unless all signs fail, the time is not far distant when the British will regret the day they listened to the siren song of Peking.

The hip-hip-hurrah campaign to induce American firms to open offices in China in order to capture its trade by sheer weight of numbers was inspired by the same group. The abnormal influx of inexperienced foreign firms ignorant of Chinese business methods precipitated the catastrophe of 1920 whose aftermath is still sending old established foreign firms into bankruptcy and the hands of receivers. Since referring to this phase of the situation in our May number, another old American firm has gone into the hands of the receiver. When the toll is complete it will stand as a solemn warning to all Americans against being swept off their feet by a group of "griffins" working in harmony with Chinese official departments.

"Co-operation with the Chinese" became the slogan of the day and in nearly every case where it was brought about, the deluded foreigners have since withdrawn or are now bemoaning their losses. Behind the really admirable points of the China trade act was the desire to get native money into these fifty-fifty Sino-American enterprises through the bait of tax exemption, but as yet only two companies have taken advantage of the new legislation. The hoped-for benefits arising from Chinese-American co-operation have failed to materialize, a dream of the dim and distant future. There is no single instance of a successful business between Chinese and American partners and there never will be so long as the native conception of commercial morality adheres to old established customs of squeeze, commissions, nepotism and utter disregard on the part of native directors of stock companies to the rights of the shareholders.

On the wave of sentiment set in motion by this group, Americans were exhorted to "invest in China." They were told that her credit was so good that no security was required for loans : that she was so solvent she could pay spot cash for everything she purchased. The Americans accepted the statements at their face value, loaned their millions to Peking, extended immense credits to the government for railway materials and financed their cotton mills and other industrial undertakings. They are now sitting on the doorstep of the treasury at Peking—whistling for their money.

This same group has stood solidly behind the Peking military oligarchy and moved heaven and earth through propaganda to oust the Anfu party and eliminate Chang Tso-lin's influence in the government in order to boost the cause of Wu Pei-fu, its chosen instrument to restore law, order and unity to China. Wu Pei-fu was painted in glowing colors as the "Hope of China," but Chinese and foreigners interested in the country are still *hoping* that he may live up to his reputation and put down the bandits who ravage his own front yard.

In order that the gullible American public should hear nothing but pleasant fairy tales about the wonderful qualities of the Chinese and the inexhaustible riches of the new "eldorado," an intense propaganda was launched to rush through the program for Anglo-American domination of the government. To accomplish this, the news from China was distorted, falsified and befouled at its source by the inner ring directing the movement, and the public at home maintained in ignorance of basic facts and conditions which would have opened its eyes in time to the true state of affairs.

The result is seen in the concessions to China at the Washington conference ; in the present breakdown of all government in the country and the usurpation of authority by the "bandits," another euphonism to conceal the truth and save the face of the spoiled children of the powers masquerading as a government at Peking. Bandits ? There are no bandits. There exist hordes of unpaid soldiery swarming over the country, looting, burning and ravishing in order to collect the pay which goes into the pockets of the greater robbers recognized by the powers as responsible leaders of the government. The *tuchuns* and the metropolitan officials rob the people and the foreigners with impunity. They have amassed nearly a billion dollars since the merry game commenced and have it safely deposited or drawing interest outside the jurisdiction of the Chinese government, safe from confiscation or capture in the vaults of foreign banks. The unpaid soldiers are simply emulating the example set them by their the real bandits who pose as and are recognized by the powers as the government of China. Wrecking a train, holding the foreign passengers for ransom and imposing terms on the legations is quite in harmony with the methods employed by the *tuchuns* in blackmailing the foreigner in other ways and by enforcing illegal taxation in violation of treaties. The result is the same. The money is extorted and the foreigner pays. That is all.

When the *tuchun* or war-lord cannot pay his troops he sets them adrift to live off the country, or dispatches them on expeditions against other provinces in order to be relieved of their importunities for pay. Wu Pei-fu is doing exactly this in sending his rabble armies to fight Kwantung. The natives of Hankow, Kiukiang and way ports on the journey tremble before every fresh detachment that passes south where victory holds out the one prospect of pay or loot. There *are* bandits in China, but ninety-nine per cent. of these gentry are the cast-off soldiers of the *tuchuns* who pocket their pay and kick them out to seek their livelihood as best they can. The result is before us.

All this is the logical aftermath to the welter of sentimental propaganda spread broadcast by the Chinafied foreign clique. This group vigorously opposed any inkling of the truth reaching the home-land until circumstances compelled it in self-defense to denounce the government. Then, and only then, did its members let out a roar. But the roar came too late. They cannot escape from their full share of responsibility for the present deplorable conditions in China with its ever present menace to foreign interests. The time has arrived when Americans in China—even the British—must squarely face the facts of a situation due in large part to the activities of this group, which, if permitted to continue, can only lead to the final triumph of Moscow and their own gradual elimination in the political and commercial life of China and the Far East. It is high time these wholly Chinafied-Americans and Anglo-Americans should see the folly of persevering in their petty attitude towards Japan and either swing into line with popular opinion at home or step aside and permit some hundred percent. citizens free from entangling business and political alliances to carry on. Their leadership has pushed American and foreign interests in China to the brink of the precipice and if they are not checked will plunge us all into the yawning abyss below.

G. B. R.

Safe and Sane

IT is always refreshing to read the reports of the Chartered Bank of India, Australia and China, as invariably they contain words of wisdom which seem to have no place in the general commercial propaganda spread broadcast from the Far East in order to encourage fresh invasions of new firms in on overcrowded market. Sir Montagu Cornish Turner, in presenting the last annual report of the bank to the shareholders on April 4th, ulto, said that at no single point in the sphere of the bank's operations have we witnessed a great spurt in business, no indication of the real revival in trade which we are hoping for so keenly as the solution of many of our difficulties—social, commercial and political. On the other hand, international trade has not been entirely dead, and we might reasonably say has shown an improvement on the position of 1921. We can say, for instance, that the effect of the terrific slump in prices of commodities is gradually working itself out ; that the top-heavy load of unsold or rejected goods in India, China and the East generally has been very appreciably lightened, though at heavy cost, and that we see rays of encouraging sunshine in place of the depressing dark clouds which encircled our horizon and obscured our vision some 12 months ago. All that is to the good. A spirit, a rightful spirit, of caution prevails at the present time, and should be encouraged. Operators must work cautiously and absolutely refrain from overloading Eastern markets with unrequired goods. We have no fear for the future. Once peace is assured—we cannot believe that the present chaos will be allowed to continue indefinitely —and the purchasing power of the consumer has been restored we can reasonably expect an active trade between East and West.

Government Support to American Publications in China

A Proper Use for the Boxer Indemnity

AT the risk of inviting an examination into our sanity, we feel impelled to endorse the idea advanced by the *Central China Post* in discussing the disposition of the Boxer indemnity which all the great powers are now hastening to return to China. American opinion holds firmly to the belief that the only solution to China's troubles lies in education through the endowment of Christian colleges ; the British, more practical, want their share of the indemnity employed to train textile and industrial experts while the French favor educating Chinese workmen into skilled mechanics who will develop a preference for French tools. Japan also entertains practical ideas on returning her share of the indemnity but will reserve action until there is a stable government to deal with.

In commenting on this universal desire to purchase the friendship of the Chinese, the *Central China Post* says :

" After all, what China needs is not the provision of a limited number of foreign-trained specialists, but the illumination of the masses, and this the press alone is capable of accomplishing within a reasonable measure of time. Most governments recognize the importance of the press. It is the tail which wags the public dog and, in their own interests, many governments take care to feed the dog—or rather to nourish the tail that it may feed the dog on the pablum considered fittest for it. 'The China Year Book' gives a list of 135 newspapers in Peking alone, all of which are said to be subsidised."

" But as a rule the British out East have nothing but ugly looks for their press. If a newsman applies at the legation or a consulate for information about some matter of public interest the chances are he will not get it. If some matter of public interest is being discussed in a municipal council, special pains will be taken to keep the matter out of the papers, and if it is only an ordinary chamber which has some public matter in hand the meeting is held in private."

" Yet newspaper men are hard workers ; their hours are long and the pay is poor. They get more kicks than ha'pence, and there is little to be gained in the game, but they still carry on. However :—

There's a good time coming boys,
Wait a little longer.

" We shall be all right when we have pocketed the Boxer indemnity."

This is the sanest editorial we have read on the disposition of the Boxer indemnity. If the Chinese are to be educated, developed into engineers, textile experts and skilled mechanics and brought to a stage where they can govern themselves and operate industries along western lines, then the press must be employed as an important instrument in this uplift campaign.

Speaking for an American publication which has carried the brunt of the fight for the past twenty years for the defense of American ideals and the expansion of our trade in the Far East, we have aided, abetted, encouraged, boosted, propaganded and contributed in cash to help forward the cause of education in China through the standardized mediums of learning yet in all these years we have never heard any mention of reciprocity.

Never a thought has been given to the urgent need of an independent American organ that would supplement the work of the colleges, missionaries, Y.M.C.A's, the factories, railways, mines and other instruments for the regeneration of China and the development of its markets for American products. Americans are keen on having organs for the advancement of their special interests, but our experience (and that of every other American publication in China) tells us that unless these publications are international in their scope and receive the bulk of their support from foreign advertising they go out of business.

The American government has no funds for publicity, or means of extending material support to a national organ for the defence of its policies and trade interests or to assist in the great work of educating the Chinese. Its officials expect at all times the most loyal endorsement of their opinions and when this is not forthcoming there are plenty of narrow-minded subordinates who go out of their way to condemn as un-American and destroy the value of the medium which holds independent views. There are, to be sure, a few broad-visioned American manufacturers who realize the urgent necessity of supporting a national publication in China, but sad to say, they are a very small minority. The American government created a consortium for the financing of China, the greatest combination of international finance ever brought into existence for carrying out an altruistic program, yet its policy has been attacked, its good faith impugned and its motives villified by the paid agents of its beneficiary. There is Chinese and other foreign money in abundance for propaganda designed to discredit America in China but not one cent to defend her. Why not use the Boxer indemnity to counteract this propaganda and educate the Chinese along lines which will convince them of our sincerity ? This is an immediate necessity, and can be done only through the press.

If American officials, philanthropists and business-men, had given the same attention and support to this phase of Chinese uplift work as they have to its purely pedagogic side, national interests in this country would have been more advanced at this time than they are. If this had been done, Americans would not now be compelled to witness the humiliating spectacle of its so-called " official organs " and exponents of national ideals passing under control of foreigners or compelled to seek a precarious existence by catering to Chinese official sentiment and endorsing insults to their own government and financiers.

Had a Simon-pure, hundred per cent. American publication in China been conceded a measure of official support and confidence which would have made it independent of the dominant Chinafied-Anglo-American group directing American opinions and policies and penalizing and ostracizing those who dared to tell the truth, President Harding and Secretary Hughes would not be repenting of having pressed the powers into making concessions at Washington now universally denounced as unmerited and premature. Nobody likes to confess mistakes, but it is well to place on record that these mistakes are traceable largely to the pressure applied to American publications in China by those whose interests were best served in keeping the people at home in ignorance. At the precise time when the American people and government needed the facts, the full weight of its official machinery working through and in harmony with the hyphenated group in China, was employed to destroy the value of the one American publication which refused to be dictated to in these matters.

However, there is a future, and if American editors and publishers, in combination with their chambers of commerce, merchants, manufacturers and financial associations would work together for the advancement of their special educational interests in China through the allocation of a part of the Boxer indemnity for publicity purposes, the dream of the **Central China Post** may yet come true.

G. B. R.

Japan's Policy Towards China

IF the newspapers of China would give as much attention to the statements of Japan's real leaders as they do to the out-of-date propaganda disseminated by the agents of the Peking government and the anti-Japanese-American die-hards, it would not take long for the masses to learn that Japan's greatest desire is to be their friend. Japan has convinced America that her new policies are sincere and if given a fair hearing will also be able to convince the Chinese. There are many foreigners in China whose usefulness will be terminated when China and Japan settle their differences and become friends. There are many foreigners who are also intensely jealous of any Sino-Japanese co-operation in business or industry feeling somehow that the closer the ties between the two countries, the harder it will be for them to compete. It is to the interest of this element and a certain section of China's politicians to divert attention from misgovernment in this country by accusing Japan of fomenting disorder and civil strife to further her so-called schemes of aggression. All this is old-stuff, handed out to ignorant Chinese and the worse than ignorant foreigners who like to see it in print.

It would be well for everybody if the Chinese could be told from time to time what some of the real leaders of Japan have to say about their national policy and feelings towards China. We have just read the speech delivered before the United States chamber of commerce on May 8, by Mr. Raita Fujiyama, president of the Tokyo chamber of commerce, and the national federation of chambers of commerce of Japan. Mr. Fujiyama, amongst other things, is the president of the Japan Sugar Manufacturing Company, Ltd., prominent in many other important companies, and a leader of the new movement for co-operation between his country, America and China. His appeal for closer relationship between America and Japan in which he tells the Americans his country's real policy towards China can be accepted as official.

" Business men," he told his American audience, " as well as the statesmen of America and Japan, should acquaint themselves with a knowledge of each other's history and economic conditions if future misunderstandings are to be avoided. They should have a sympathetic understanding of each other's hopes and ambitions and only through such knowledge and understanding will we find it possible to maintain peace and promote our mutual interests as partners in the Pacific.

" Our old time militarists and bureaucrats in Japan are dying, and those that remain have been shorn of their power. The people of Japan to-day are awakened politically; they realize fully the danger of entrusting political power to militarists and bureaucrats; they want their government to be administered in accordance with the policy that they desire. What then, is the national policy desired by them ?

" It is nothing but a policy of industrial and economic development. The foundation of commerce is industry. Japan must adopt a policy that will develop her industries and must concentrate her energies on attaining the means of subsistence for a population which is increasing by 500,000 or more a year.

" Japan's industrial problem is not only the problem of markets for her products, but the problem of securing raw materials for her factories. Our interest in China is that of being able to secure from her the raw materials necessary to our existence. It is neither necessary nor desirable that we should attain these ends by military means. Indeed, it is to our greater advantage to secure and maintain a peaceful commercial co-operation, through which we may be supplied with those things we need, and secure a market for the articles which we manufacture.

" Our intentions toward China are to establish a policy, not of aggression, but of economic co-operation. Unfortunately, this has not been well understood in America.

" Now, business men of America, it is to your intelligent economic co-operation with Japan that my country is greatly indebted in attaining her present industrial development and her present prosperity in business. And to-day on this great occasion, I, as president of the national federation of the chambers of commerce of Japan, take the opportunity of thanking you for the splendid help and co-operation that you have rendered us as our partner in the Pacific.

" Someone has said that commerce, like a delicate plant, grows only in the genial atmosphere of peace and solidarity. It is also true that the mutual understandings, trust and friendships established through commercial intercourse will build firm the foundations of lasting peace as no other relationships can do. A commercial inter-dependence on established mutual confidence can be depended upon to build up a friendship and brotherly love which will outlaw war and national aggrandisement.

" It is my earnest wish to see the business men of this country and of Japan, apart from politics played by unprincipled politicians, bring about a complete understanding of each other's hopes and ambitions and establish firm business co-operation between America and Japan."

The above extracts from this splendid exposition of Japan's policies and appeal for better understanding certainly carried weight with the business-men of America, yet just about the time it was being made, American chambers of commerce in China were protesting against such co-operation for fear that it might be inimical to the open door and provide Japan with the means to advance her imperialistic designs !

The professional anti-Japanese element in China will exclaim: " Fujiyama is pulling the wool over America's eyes : the real rulers of Japan are the militarists who are using the business-men to lull the suspicions of the United States while they plot and push forward imperialistic plans." So it is well to listen to what one of the actual rulers of liberal Japan has to say about her policies. Next to the present premier, the former occupant of the post and leader of the Seiyukai (the majority political party in the diet), Viscount Korekiyo Takahashi is the biggest man in Japan to-day. He recently contributed a series of three articles to the *Philadelphia Public Ledger* in which he explains to the American people Japan's vital problems arising out of a rapid increase in population and the necessity of providing for their existence through a supply of raw materials that will enable them to work, sell the produce of their toil abroad and subsist. With the doors of all white nations closed against the entrance of Japanese immigrants the question of the future of the race looms large in evolving a peaceful national policy of development. Viscount Takahashi says about this :

> " The freedom of migration is of immense importance to the future of Japan. The population of this country is increasing yearly at the rate of 750,000. It is computed that in about fifty years the present population will be doubled and by 1960 it will reach 100,000,000. In point of density, the Japanese population ranks fourth in the world, and the results of the census taken in October, 1920, indicate that on the average 2,239 people live within the area of a square mile. Notwithstanding this, Japanese colonization and migration projects fail on account of national idiosyncrasies and other obstacles. The average number of the Japanese going abroad to settle in foreign lands does not exceed 50,000 or 60,000 annually ; and this number is too small to have any substantial effect toward relieving the population situation. The rapid increase of the population renders the unemployment problem more acute and complex and adds to the social unrest. In order to put an effective check on the growth of this tendency it is an absolute necessity that a food policy should be firmly established and the freedom of the movement of the population secured."

Freedom of emigration is denied to the Japanese for the present, so in order to establish a firm food policy, the doctrine of the open door to the whole world is as basic and vital to Jopan's existence as the same principle is to the United States for other good reasons. Continuing, Viscount Takahasi says :

> " The radical principle of Japan's foreign policy must be to secure the open door of the whole world. Special care must be used for basing all of Japan's assertions on the equality of opportunity. Should she make the mistake of demanding concessions or special rights or interests to the exclusion of others, her policy necessarily will meet with many insuperable obstacles. Such a policy is hardly in keeping with the spirit of the new age.
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> "While keeping the open door of the whole world as her final aim, Japan must direct her first attention to the general opening of the door in China, Russia and around the Pacific, as her geographical position requires it.
>
> "The open door in China is, as already stated, recognized by the powers. In actual practice, however, this principle has not been fully observed owing to the existence of the various spheres of influences and protection of special interests. At the Washington conference, however, this principle was once again affirmed, and it bids fair now to be put into actual operation. What is important at present is to make China abandon her policy of closing the door and revoke the corn law and the mining regulations. Efforts must then be made in the direction of attaining co-existence and co-prosperity by economic co-operation between Japan and China, Japan supplying China with capital and technical knowedge in return for a plentiful supply of raw mate-

> rials which we should expect to receive. By these means it is to be hoped that the problems of population and raw materials may be brought much nearer solution. In order to carry out this economic policy Japan must adopt toward China an absolutely pacific policy, always maintaining an attitude of impartiality toward the various factions in that country."

Could anything be clearer ? Co-operation with China is admitted by the leader of the dominant political party as the pressing need of Japan, the cardinal point in her new national program. It is difficult to go behind these convincing statements which tell us that Japan's business-men, statesmen and thinkers are unanimous in their views on the future of the nation and are working in complete unison for the peaceful solution of vital problems along lines which will bring security to China and increased trade and prosperity to every other nation interested in her development. Confronted with the solution of these vital problems of existence, dependent to a large extent upon China for food and raw materials, for the right to exist, it is folly to believe at this date that Japan harbors imperialistic designs upon her neighbor that would jeopardize her future welfare. It is worse than folly, it is criminal, to circulate stories that she is intriguing to prolong the present chaos in China by instigating bandit raids on towns or trains when her immediate prosperity depends to such a large extent upon the restoration of order and the establishment of a unified government in this country.

Illegal Taxation in China

WHILE the bandits are holding up the individual foreigner, the *tuchuns* are exacting illegal tribute from whatever commodity they can squeeze it from. The province of Chekiang has now put an additional twenty per cent. *advalorem* tax on cigarettes, a flagrant violation of treaties which has called forth a vehement protest from foreign tobacco firms on the ground, supported at home by the full weight of the tobacco merchants' association. The formal protest submitted to the state department and with the bureau of foreign and domestic commerce by Mr. Charles Dushkind, counsel and managing director of the American tobacco merchants' association, is to be one of the most important matters for consideration at the tobacco men's national convention to be held in Washington, May 16 and 17. The present treaties stipulate a five per cent. *advalorem* duty with the prospect of the additional 2½ per cent. surtax provided for in the Washington treaties, and as these treaties are with the central government no provincial authority has the right to impose additional taxes. The central government at Peking has established a wine and tobacco bureau which collects the consumption tax on these commodities and two years ago the cigarette companies entered nto an eight-year agreement with the officials of this bureau to pay additional taxes on their products over and above the duties fixed by treaties, the method of payment, method of determining the payment and other details connected with the collection. The attitude of the provincial authorities of Chekiang therefore constitute a gross breach of the treaties and an injustice to American and foreign importers of cigarettes. The authorities of Hupeh have followed the lead of Chekiang and levied a similar tax and the raid on the cigarette revenues is being extended to the other independent" governments which make up the congery of China's feudal states. In the protest to Secretary Hughes, the tobacco merchants' association says :

> "On behalf of the tobacco industry, including tobacco growers, manufacturers, dealers and exporters, we most earnestly petition your honor to take all needful steps to secure the abrogation of the decree or legislation recently passed or promulgated by the local authorities of the province of Chekiang, China, levying an *advalorem* tax of 20 per cent. on cigarettes.
>
> "It is our genuine conviction that the imposition of such tax, by any of the provinces of China, constitutes a distinct violation of the treaties and understandings with the Peking government, and we respectfully submit that this is not only a matter of concern to American tobacco growers and exporters but also to all other industries interested in Chinese markets, for if this action of the Chekiang authorities should be permitted to stand unchallenged a similar situation affecting many of the American industries are likely to follow, not only in Chekiang but in the other provinces of China as well.
>
> "It is to be noted that this tax is levied in treaty ports, as well as in other parts of the province.
>
> "We beg leave, therefore, to register our earnest protest against this unauthorized tax levy and sincerely trust that you may deem it proper to take this matter up with the Chinese government with a view to securing repeal of this tax measure,"
>
> "Collection of this tax, in addition to being a flagrant violation of assurances and treaty rights granted by the Peking government, tends to confirm the doubt which seems to be entertained as to whether the Peking government can control the acts of local authorities throughout the various provinces of China."

In response to the protest of the American and British legations, the united chamber of commerce of Ningpo has wired the Chinese foreign office that the special cigarette tax has nothing to do with the business of the British-American Tobacco Company because it has been collected on the Chinese buyers and not from the foreign sellers, not to mention the fact there are other sellers in the markets than the said British-American Company. Furthermore, the proceeds of the special tax will be employed for the construction of national roads for Chekiang so that after their completion, both foreign and native businessmen will be benefited in the transportation of their goods for sale. On account of this, the Chekiang authorities do not think the special tax will affect the interests of foreign traders so they are going to continue it. So there you are. A flat declaration of independence on the part of Chekiang, refusing to be bound by the treaties. What will the powers do about it ?

A Splendid Achievement

NOTHING that has occurred under General Wood's administration of the Philippines so eloquently proclaims the utter incompetency of the Harrison *regimé* as the disclosures contained in the 1922 report of the Manila Railway Company : nothing that has yet been brought forward so conclusively corroborates the findings of the Wood-Forbes mission recommending the urgent necessity of a complete reversal of policy in order to save the islands from industrial ruin and bankruptcy. The report of the railway will stand as a most forceful argument against state ownership or political control in future discussions of this much debated question, another proof, if such proof be needed, that the political control of public utilities in backward countries will always be employed by politicians to find jobs for their henchmen and relatives and to foster graft and extravagance in purchasing supplies.

It is doubly gratifying to Americans who gave the best of their lives and experience under the republican administrations for the advancement of the islands, that one of their old colleagues who contributed so largely to their wonderful progress from the time we took possession, should have been the instrument chosen by General Wood to illustrate by practical methods the wide gulf which separatted the two governments. No executive was better fitted for the post of general manager of the Manila Railway than Colonel Henry B. McCoy, who, ever since he landed at the head of the first Colorado volunteers and raised the first American flag over the city of Manila, has stood for all that was best in American political ideals.

Resigning from the army to enter the Philippine government service he was appointed deputy collector of customs in 1901, retaining that position until 1910 when he was made collector, resigning only when the advent of the Harrison administration made impossible the further retention of the republican appointees to the higher posts in the government. His efficiency as an executive and public official for which he was noted in the direction of the insular customs has not deterioriated in the ten years he has since devoted to private business, and his brilliant success in the first year of his management of the Manila Railway must be accepted as a further tribute not only to his personal fitness but to the efficiency of a group who were made to walk the political plank in 1913 and see their work of years handed over to incompetents who in eight short years, and during the unprecedented prosperity of the great war, brought the islands to the verge of bankruptcy, from which it was only saved by the prompt and energetic methods of the new administration.

Once more we have in the success of Colonel McCoy, a further evidence of the executive abilities of General Leonard Wood. The first essential to greatness is the ability to select able lieutenants and stand by them while they accomplish their tasks. Wood's record in Cuba was due to his wise and careful selection of the proper men for the job, and in this case in the Philippines he has lived up to his reputation.

Standardization and the Urgent Need of Its Application to the Electric Power Supply Industry in China

Paper Read before the Engineering Society of China by E. A. Mills, Assoc., M. Inst. C.E., A.M.I.E.E., A.M.I.Mech.E.

THE industry in this country being in its very early infancy compared with that of most countries presents a unique opportunity for taking advantage of the pioneer work done in other countries to ensure its development on sound economical lines.

The development of a power system may be likened to the development of the railways of a country and it is just as impossible to secure economical power generation and supply by each individual plant working independently as it would be to have an efficient railway system if each installation owned its own lines and fixed the gauge and other important details without consideration for the country as a whole. Similarly for the power supply industry it is not economical or sound to lay out systems at various frequencies because as development proceeds sooner or later interconnection will be necessary and it is not possible to interlink two systems of different frequency without adopting some form of rotating frequency changer.

Electric power supply is destined to be one of the most important problems of the future and will eventually become the key industry to all other industries. For this reason it is necessary to emphasize the importance of adopting standardisation not only in the power station and distribution system but in the consumer's premises whether large or small. Without exception the difficulties to be met are probably greater in China than in any other country in the world. Her environment has handicapped her development. Hemmed in to north, west and south by mountain ranges and deserts and having for her neighbors immediately beyond these barriers only the more backward peoples of the earth, she has been out of touch with the rest of the world. It is only her eastern coast that is washed by the ocean and this is her most remote boundary from other civilizations, but at the same time it must serve as her only inlet from the rest of the world. Having these disadvantages and not being primarily an engineering nation practically all her machinery and electrical apparatus is imported, consequently uniformity is not the natural tendency, and until standardisation is universally adopted by all the manufacturing nations of the world it is essential that those engineers who are responsible for the expansion of the industry in China guide its progress so that the maximum efficiency will always result, and to obtain this it is necessary to take a long view and keep in mind the magnitude to which it may ultimately reach.

Unified System of Supply.—It has been proved both theoretically and practically that no advantage is to be obtained by generating either a single or two-phase supply in preference to a three-phase supply. If for any purpose one of the two first named methods of supply are required these can be readily obtained by transformation from a three-phase circuit.

There is little excuse for more than one frequency and its value should be either 50 or 60 cycles. Frequencies of other values are in use, such as 25 and 40 cycles, but extensions of these should be discouraged. True economic principles are not presented by adopting a system of distribution for some installation that would make it impossible to connect either in emergencies or ultimately for good with some other source of power except through expensive and inefficient frequency changers with all their disadvantages. One standard frequency will enable interconnection of systems, a very essential requirement from an economical point of view.

The primary advantage of interconnection lies in the fact that the combined load may be carried with a materially smaller amount of installed generating capacity and at the same time with higher efficiency. The saving possible as a result of diversity in maximum load between separate systems even when the loads are of a generally similar character is greater than is ordinarily realized. A similar saving will result from the relatively smaller amount of generating capacity required for reserve purposes.

Fifteen to twenty per cent. increased load may be carried as the result of interconnection. The exact figure depends on how far interconnection is carried and will naturally be greater if extended to wider limits. The saving in capital expenditure is highly important, as this has a very direct bearing on the selling price and the higher load factor upon the generating stations will enable more efficient use of fuel.

Interconnection over a wide area will alone make feasible the increased sizes of stations and of individual units which constitute so essential an element in working out the economies in expenditure and in fuel consumption towards which we are aiming. In this connection it should particularly be borne in mind in any comparison with the present method of relatively local generation that the comprehensive system will bring the benefits of generation on a large scale to the entire area served by the system. An important industrial advantage of interconnection is the flexibility as to points where the energy may be distributed and the readiness with which load may be shifted from one part of the district to another. New consumers may be connected up at any point within the area at very short notice, whereas under present conditions they could only be supplied at great expense after long delay involved in the building of new power plants unless such prospective consumer is within the local restricted area of supply such as the International Settlement of Shanghai. This flexibility is of particular advantage in the case of large loads of a temporary character.

The frequency more generally used in China is 50 or 60 cycles. These frequencies are more generally applicable than 25 or 40 cycles to all the varied conditions met with in the distribution of power. More speeds are available with the higher frequencies than with 25 cycles, or intermediate frequencies. Motors for 25 or 40 cycles are more expensive to build than 50 or 60 cycle motors. They are more bulky and less efficient, and have no better operating characteristics and this same condition exists in the designs of transformers.

The higher inductance of 50 or 60 cycle apparatus has a tendency to dampen out disturbances originating in any transmission lines that may be feeding them, this being particularly true with very high voltage.

Synchronous converters which are now used almost universally for transforming from alternating current to direct current are now designed for operation on systems with the higher frequencies, and can be considered very reliable and efficient pieces of machinery for all conditions.

Another feature which should be considered is that the cost of apparatus is greatly affected by the multiplicity of parts. This is true not only in first cost but in maintenance cost. Take for instance alternating current motors, if manufacturers have to develop a complete line of motors for each different frequency in use, usually for several different voltages and two or more speeds together with the various methods of ventilation, this by no means produces a particularly economical manufacturing condition, and in consequence they cannot be expected to offer motors at the lowest possible price.

Unfortunately those nations who supply China with electrical machinery have not all adopted the same frequency and the manufacturers will when possible, recommend the frequency best suited to their own products. As development takes place in China this duplication will provide an inefficient individualistic state of the electric supply industry and render it a persistent obstacle to a comprehensive handling of the power supply problem and make it impossible to obtain just the advantages which are peculiar to the generation and distribution of electrical energy in regard to the economy of capital, economy of coal and other sources of power.

Standardization of Voltages.—The next consideration is the voltage of supply. In the interests of economy it is necessary to have several voltages and the number depends on the size of the system or installation. The first is that for detail distribution giving a supply for lighting and heating apparatus for domestic purposes.

At the present time the single-phase voltages for this purpose vary between 100 to 130 or 200 to 250 but in neither of these ranges is there any accepted standard. It is suggested that only one or at the most two values are sufficient. If voltage standardization could be agreed upon a very great benefit would accrue to the electrical industry. All apparatus which has to be closely selected for voltage such as lamps and heating utensils could immediately be manufactured and distributed with less cost and the saving would eventually react to the benefit of the ultimate consumer. Not only would the production and distribution be cheaper but it would be much more rapid. Contractors for electrical supplies could for the same investment in stocks carry more kinds and sizes of electrical apparatus where now they have to carry lines of apparatus of slightly different voltage.

As an illustration that standardization is required it is only necessary to mention the different voltages used in detail distribution in the international settlement of Shanghai and the French settlement. Those who use heating apparatus and have changed their residence from one settlement to the other will appreciate the draw-back of having two voltages for this particular kind of supply.

It is possible to maintain the supply voltage within six per cent. of the standard so that if a standard pressure of 200 volts were adopted, it would be unnecessary to have lamps manufactured for more than two voltages and this must have a marked effect on the cost of manufacture.

The next pressure is one that is necessary for a local supply to factories and workshops and is somewhat inter-dependent on the voltage for detail distribution as it generally determines the latter. The higher value of voltage known generally as the medium pressure supply varies between 350 volts and 550 volts. Instances may be quoted of three-phase motors being manufactured for the folowing supply voltages—350, 400, 415, 440, 500 and 550. It must be admitted that so many different voltages are unnecessary. The demand for electric motors is ever increasing and for each manufcaturer to properly care for his share of the growing volume of business he has found it necessary to standardize his product as far as possible and to put production on a mass basis. Not only does this simplify factory methods and reduce overhead charges but what is of equal importance it means better service at lower cost to purchasers.

The facilities for handling special or modifications of standard apparatus of necessity extends through an entire organization as each case must be treated separately and on its merits : whilst in constructing and selling standard apparatus the most direct course is adopted from producer to user. Herein lies the saving by standardization as it presupposes mass production and the retailing of the article on the basis of wholesale cost.

The figure of 500 volts mentioned above is a case of a large industrial installation where it was found more economical to instal motors built for this pressure than 400 volts, this being the standard voltage for the district, as the saving on cables alone was considerable. This is an instance where motors built for a pressure of 2,200 or 3,000 volts should have been adopted and there are many other industrial establishments where motors built for this pressure would have proved more economical. A further advantage is that better voltage regulation would be obtained on the cable system. As a consequence a pressure of about 2,200 or 3,000 volts appears to be necessary as a standard.

Numerous voltages are adopted for purposes of generation up to 11,000 volts which is the maximum safe pressure. The economical generation pressure depends to some extent on the area of supply and the main distribution pressure. Under certain conditions it is very difficult to show that any pressure for the latter purpose below 50,000 volts is more economical than 11,000 volts owing to step-up transformers not being necessary, which extends the use of this pressure in an exceptional degree. When step-up transformers are necessary, a lower generation pressure from 5,000 to 6,600 volts would be more economical, but it is quite unnecessary to adopt various values in different parts of the country.

As development proceeds higher voltages will be found necessary but it is impossible to fix a definite standard except within certain limits.

Physical dimensions is another direction in which standardization might be applied within reasonable limits. At present it is not possible to purchase motors of the same rating from two different manufacturers whose physical dimensions are within sufficient limits so as to be easily interchangeable one for the other without more or less changes in the foundations.

It is recognized that all the physical dimensions of each motor rating cannot be fixed because of differences in shop practices and the widely varying ideas of designing engineers, but there could be approved limits within which new designs should fall and which would not interfere in the slightest degree with manufacturers' individuality of design.

A technically sound system of electric power supply is one with the problem of industrial development of the country and largely depends on increasing the net output per head of workers, consequently if it is developed on the most economical lines it will always be possible to offer a supply of electrical energy at the lowest possible rates.

In conclusion, when in 1841 Sir Joseph Whitworth was urging the necessity for standardization in Great Britain after he had introduced his standard screw thread, he illustrated his argument by mentioning that candles and candlesticks were in use in almost every house and nothing could be more convenient than for candles to fit accurately into the sockets of the candle sticks, which they seldom did. To-day this illustration applies with equal force to the electric power supply industry in China.

The difficulties of applying any form of standardization in China are admittedly great, but if through some centralized body representative of manufacturers who supply electrical plant and apparatus and those connected with the distribution of electricity alike can be persuaded to accept agreed standards, the interests of the industry as a whole would be realized and a high average efficiency secured. Satisfactory standardization is not arrived at by any section of the community imposing its opinions on others but rather the result of co-operative active on the part of all concerned.

The natural tendency of such procedure is to raise the standard as it reflects the concensus of opinion as to what constitutes the best practice. To ensure the best results it is imperative that any committee appointed to deal with the matter should be representative and all who have or could have any interest in any proposed standardization should give active assistance in drafting any recommendation. Such methods would register the views of the manufacturers as well as those intimately acquainted with the conditions of every day service and would ultimately bring about a feeling of mutual confidence such as could not be realized by isolated action on the part of either, however honorable and straight forward it may be.

The condition of the industry in London is an excellent illustration of lack of standardization. There are 109 supply authorities, 18 frequencies and 45 distribution voltages. If the industry in China is allowed to drift and each manufacturer and engineer is allowed to proceed on individualistic lines, then it is hardly possible to expect a supply of electrical energy at the lowest possible prices and industrial development must be limited.

China and the Consortium

A leading article in a recent issue of THE FAR EASTERN REVIEW discussing the relation of the consortium and other financial undertakings connected with China, concludes as follows : As long as complete harmony, mutual trust, and confidence exist between the groups, the consortium will fulfil its mission, but just as soon as any independent British, French, American, or Japanese bank or commercial concern slips through a profitable contract by advancing funds to a needy government, be it to Peking, the provinces, or a municipality; the nationals of the other groups will charge unfair practices, and will go and do likewise. In the general scramble for profitable business, it will be difficult to avoid transactions of this nature, and it will require great patience and goodwill on the part of all to avoid hard feelings and jealousy.

Shanghai as a Field for Electric Furnaces

By Lansing W. Hoyt, American Trade Commissioner

AT the present time there is but one electric steel furnace in China proper. This furnace is now being installed in the foundry of the Kiangnan Dock and Engineering Works at Shanghai. An electric furnace is operating in the British colony of Hongkong but strictly speaking there is not to-day a single steel foundry in China—either Bessemer, openhearth, malleable or electric.

The only city in China where an electric furnace (either Ferrous or non-ferrous) could be profitably operated at the present time is Shanghai. This city has greatly increased its municipal supply of electric power and the international settlement power house at Shanghai is as modern and efficient as any station in the world. The cost of electric power to large users of current is lower than it is in most parts of America. Power is delivered to cotton mills in Shanghai at less that $1\frac{1}{4}$ gold cents per kilowatt hour. The price charged for electric power at Milwaukee (the centre of the electric steel casting business in U. S. A.) averages nearer $1\frac{3}{4}$ gold cents.

In order to be more specific the writer will give below cost figures for actual operation in a cotton mill at Shanghai using municipal power.

Electricity is supplied on that is known as the "bulk" system of charging, whereby two separate and distinct charges are made. These charges are known respectively as the "Capital Charge" and the "Running Charge."

The capital charge is based upon the amount of capital which the Shanghai Electricity Department has to expend in order to meet a definite demand. This naturally varies to some extent with location of such demand in relation to the position of the municipal generating station.

The running charge is based almost entirely upon the actual cost of generating energy, and is naturally greatly influenced by the cost of fuel for the time being in force. To meet this variable factor a basic charge per kilowatt hour is made, based upon the assumption that fuel can be purchased at a cost of 1.6 gold cents per 100,000 British Thermal units. In the event of this assumed cost being either greater or less than the figure given, then a proportionate increase or decrease in the basic running charge is made effective. The equity of this arrangement will be apparent when it is borne in mind that the cost of fuel is outside the control of the municipal authorities.

Concrete Example.—A cotton mill, requiring 1,000 kilowatts, located near the main station in Shanghai is delivered power at 5,000 volts.

In this case the capital charge is G. $26,40 per kilowatt hour per annum and the basic *running charge* is .00616 gold cents per kilowatt hour.

To arrive at the "all in" cost per kilowatt hour, let us consider the operation of the mill over a month's time. Doing this we obtain the capital charge as follows :—

G. $26.40 . . 12 months × 1,000 k.w. = $2,200 gold.

The consumption in kilowatt hours during the month was—

27 days × 24 hours × 65% of 1000 = 421,200 kilowatt hours
(421,200 × G. $0.00616) . . = G. $2,594.40
Hence Capital Charge . . . . = G. $3,200.00
Running Charge . . . . . . = G. $2.594.40

G. $4,794.40
Hence "all-in" cost . . . . = G. $4,794.40

K.W. hours 421,200
= G. $0.01138 per kilowatt hour

Allowing for fluctuations in the price of coal at Shanghai which would effect the running charge, the writer (as stated above) considers his figure of about $1\frac{1}{4}$ gold cents per kilowatt hour as ample to cover. The exact figures for this mill, of course, indicate about $1\frac{1}{7}$ gold cents.

By means of these figures, Americans interested, will be able to compare the cost of electrical energy in Shanghai with that prevailing in manufacturing centres in America, and the writer is confident that they will find that the supply given by the municipality of Shanghai will compare very favorably.

So much for the cost of power, which in electric furnace practice in America usually constitutes one-third the cost of the steel in the ladle. Under conditions obtaining at Shanghai a very accurate estimate of electric hot metal costs can be made as nearly all materials entering into these costs have a known value in Shanghai, although none of these materials have ever been utilized in steel foundry practice here.

Let us assume that a 3-ton *acid* electric furnace is to operate in Shanghai and that a rate of $1\frac{1}{7}$ gold cents per kilowatt hour has been contracted for from the city electricity department. (An acid furnace melts faster and consequently consumes less power. It is well suited to this market, because furnace practice in Shanghai need only be a straight scrap malting process. The furnace itself, of course, must be 3-phase for the city station could not allow a single-phase furnace to operate.) With this assumption, the figures given below have been deduced from what are known values for the scrap alloys, refractories and labor necessary to place an electric heat in the ladle. Electrode costs cannot be quite as accurately estimated because no electrodes have hitherto been imported into China.

6000-lbs. CHARGE (Figures in net tons).

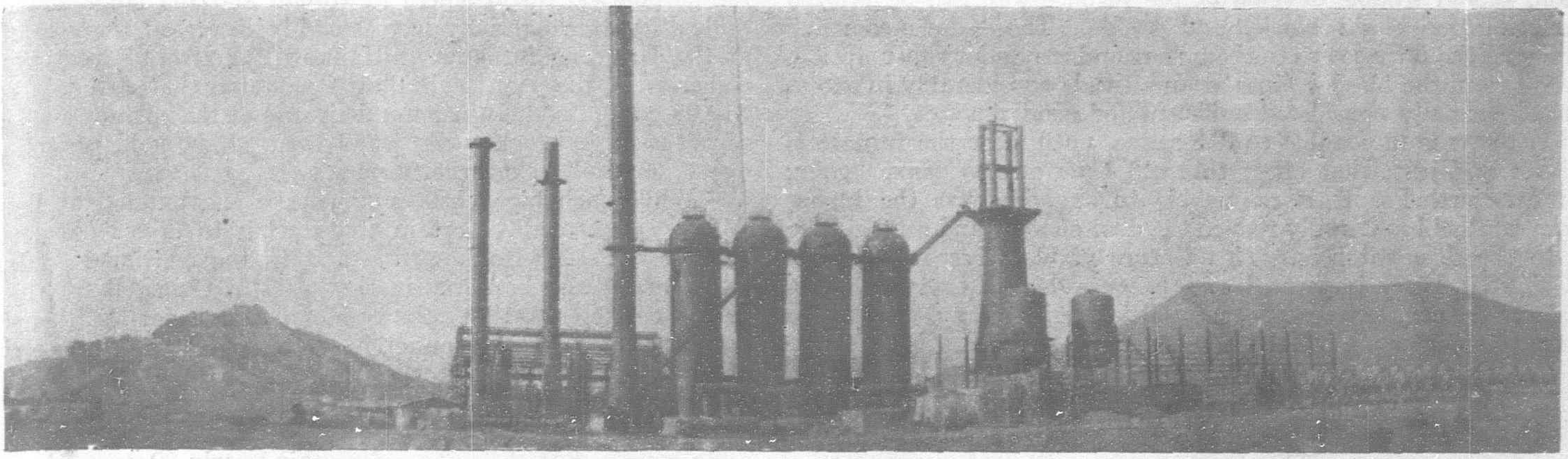
Materials	Price per ton	Consumption	Cost per heat
	G. $	G. $	G. $
35%, Plate scrap	.. 22.00	1,500-lbs.	16.50
10%, Punchings ..	.. 18.00 (local)	600 ,,	5.40
25%, Axle turnings	.. 18.00 ,,	1,500 ,,	13.60
40%, Operating Scrap	.. 19.70	2,400 ,,	23.64
4%, Loss	.. 0.78	240 ,,	1.63
Ferromanganese ..	.. 75.50	50 ,,	1.88
Ferrosilicon ..	.. 70.00	25 ,,	.87
Aluminium ..	..388.00	5 ,,	.97
Ganister	..	150 ,,	1.00
Silica Sand ..	..	50 ,,	1.00
Electrodes ..	..200.00	65 ,,	6.50
Brick	..		1.60
Ladle drying ..	..		5.00
Electricity	$1\frac{1}{7}$ per kwbr.	1,800 kwbr.	20.52
Labor	..		1.00
Laboratory expense	..		1.50
Total for heat	.. .. ..	6.585-lbs.	102.71
,, ,, net ton ..	.. ..		34.24

From the above cost sheet, it will be observed that while the most desirable scrap for electric furnace work is more expensive in China than it is in America, still the cheaper electricity and the lower priced labor brings the cost of the hot metal in the ladle down to a figure which compares favorably with good electric steel practice in the United States.

The Chinese are excellent pattern makers and moulders and have been used to iron foundry work for generations. There is every reason to suppose that they would, with capable supervisions, readily and efficiently grasp the details of steel foundry operations. Electric steel can be melted in Shanghai as cheaply as in most cities of the world and owing to this steel's freedom from oxygen it would be the kind of metal best suited to Chinese practice.

A great advantage obtaining in the Chinese market over markets in America is the high price for finished steel castings. Prices for steel castings in Shanghai range from 25 gold cents to 30 gold cents per pound and where emergency work is required even higher prices could be demanded by a steel foundry located here.

The Chinese customs returns do not show steel castings as being a product of much value in imports. These customs statistics, however, do not go into detail and while thousands of tons of steel castings enter China each year, they are grouped for the most part under the general term machinery.



Blast Furnace of the Lungyen Mining Administration near Peking: during construction

Blast Furnaces and Steel Mills in China, 2

A Comprehensive Survey of China's Steel Industry

By Lansing W. Hoyt

(The author of these reports is the American trade commissioner at Shanghai, who, before entering the government service, was for many years connected with the United States Steel Corporation and the Tata Iron & Steel Company, Ltd., of India. Mr. Hoyt is, therefore, an authority on his subject, and was instructed by the department of commerce last year to draw up the report on China's steel industry. These reports, since released by the bureau of foreign and domestic commerce, are undoubtedly the most careful and reliable ever presented to the technical press. The reports emphasize the slow progress of steel manufacture in China due to many natural and economic causes which together make it possible for foreign material to be delivered in China and undersell the home product.)

The Lungyen Blast Furnace

THE most recent addition to the ranks of blast furnaces in China is the newly completed stack of the Lungyen Mining Administration located on the Mentakow branch of the Peking-Suiyuan Railway, about eleven miles from the city of Peking. This furnace is the only one in the so-called Chihli district of China and from the standpoint of design and auxiliary equipment is undoubtedly the best arranged plant in Asia, India alone excepted. It has a rated capacity of 250 tons of pig iron per day or about 90,000 tons per year. The plant was designed by Porin and Marshall, engineers, of New York, and ground was broken during the winter of 1921. In May of that year foundation work was started and in July the actual work on the "stack" itself commenced. The engineers are to be congratulated on the way the work was pushed to completion. There are few plants in the United States that have been completed in such a short time. Unfortunately, the political trouble culminating in the battle of Peking last March interfered with the financial side of the Lungyen Mining Administration's program, the leading stockholder finding it necessary to flee to the international settlement at Tientsin to escape his enemies.

The Company was originally supposed to have Mex. $5,000,000 in its command, but only $2,500,000 was paid in. This latter sum has been used up in completing the plant, and, at present, while everything at the site has been paid for, there is no money left for operation. This modern well-equipped "stack" could be "blown in" within a few weeks, if the operating capital were available. It stands to-day a good example of the energy and engineering skill of American builders, but no attempt is being made to make pig owing to the financial condition of the Lungyen Company.

Another View of the Lungyen Blast Furnace

The furnace measures 85-ft. from hearth to charging platform; is 18-ft. through the bosh and 13-ft. at the hearth. The hearth jacket is of steel plate construction, lined with cast iron cooling plates. The stack is supported by eight fabricated steel columns. The tuyeres, eight in number, are of easy access, being offset from the columns in order to provide maximum working space. There are two iron notches, one above the other, the upper one to be used in case of emergency. The cinder notches are two in number, at the same level, and 90° apart. The tuyere and bosh jackets are constructed of heavy steel plate, protected by bronze cooling plates. Above the mantle just below the first ring of shell plates is a line of cast iron cooling boxes. The upper part of the lining is protected by cast iron wearing plates built in the brick. As a result of costly experience gained at the Yangtsze furnace, American brick was used for the furnace lining proper instead of domestic brick, although the stoves are lined with Chinese (Kailan Mining Co.) No. 1 fire brick. Chinese refractories do not as yet stand up under high temperature and wear, such as is encountered in blast furnace operation.

One of the distinctive features of this furnace is the Marshall top. The four bleeder pipes rising 43 feet above the level of the charging platform give a very sturdy appearance to the superstructure. These bleeders are high enough to efficiently carry excess furnace gases away from the working platform and in addition, should trouble develop at the furnace top, can be utilized as rigging for chain blocks and tackle. The "down-comers," conveying the furnace gas to the boilers and stoves for consumption, lead off from the bleeder pipes at an altitude considerably in excess of that normally considered sufficient for good practice.

While it is impossible to determine, until after the furnace is "blown in," just what effect this will have on the gases "going over," nevertheless it is reasonable to suppose that the higher "take off" will materially reduce the dust content and send clearer gas to the dust catchers. This feature of blast furnace practice in China is a very important one, because despite every effort to obtain clean gas, extraneous material is carried along, due to the nature of the raw materials it is necessary to use.

The four, two pass, stoves are fitted with inverted Spearman burners and are of the Marshall type. These stoves are built up with the best grade Kailan fire brick (Chinese), which has proved satisfactory for stove service.

The boiler house contains five, 500 horse-power vertical Wickes boilers, fitted with Foster superheaters, delivering steam at 165° superheat under 200-lb. pressure.

The power house contains two 20-in. by 30-in. Norberg engines, which drive two 350 kilowatt generator sets. "Wind" is delivered by two Ingersoll-Rand turbo-blowers of 3,000 H.R.M.

Possibly one of the best features of the entire furnace lay out is the very modern methods employed in handling stock. The stock-house is of sturdy construction super-imposed upon a 360-ft. concrete tunnel, the roof of this tunnel being perforated at intervals by hoppers to permit the ore and stone to drop through into the scale car below. The scale car carries the weighed charge to the skip pit where it is dumped into the skip-car and carried to the furnace top. An Otis elevator steam hoist operates the skip. While the limestone and ore are exposed to the weather above the tunnel, the coke stock is under cover and is stored in ample steel bine above the skip pit.

Water Supply

One of the most difficult engineering problems which seems to have been overcome at Lungyen is the manner in which an ample supply of clean water is assured. The Hun river is the natural source of supply but owing to the heavy load of mud carried by this stream, it was necessary to provide a settling tank where gravity could reduce the mud content to a workable proportion. From the settling tank the cleansed water flows to a 60 million gallon reservoir located near the furnace. A half million gallon capacity pump delivers the reservoir water to a large sized concrete water tank near the power house. While it will be necessary for this water system to stand up under operation before it can be said to be adequate, nevertheless the experience gained through a study of the difficulties encountered by an adjoining municipal power station, certainly warrants the statement that Lungyen will be free from serious trouble in this direction.

Raw Materials

The Lungyen Co. has been granted mining rights in areas in the province of Chihli from which it is assured a large supply of iron ore of good quality. The metallic content of the ore averages about 45 per cent., and in actual operation in the furnaces at Hankow, it proved itself to be on a par with the certain Yangtze River deposits. From a blast furnace standpoint, no difficulty should be experienced with the ore. The iron deposits of the Lungyen Co. are situated at Lunghwa (Chi.) and Süanhwa, which properties are connected by rail with the Peking-Suiyuan Railway.

Limestone deposite lie within seven miles of the plant and are connected by a standard gauge line with Sanchiatien, a town near the furnace site on the Peking-Suiyuan Railway.

The problem of good coke at a reasonable price, however, is one that will have to be worked out in practice. No doubt Lungyen will be able to make a good grade of merchantable pig, but there is some doubt as to whether this pig can be made at a cost which will enable Lungyen to compete in Japan and other Far Eastern markets against American, European and Indian pig. This doubt is based primarily on the cost of coke delivered at the furnace. From an engineering standpoint, Lungyen will in all probability be a success, but it remains to be seen whether or not coke can be brought to the furnace stock-house for under the figure now quoted at Hankow, namely $14.00 gold per ton. In fact, the recent political disturbances in Hunan and the labor and mining difficulties at Pinghsiang have steadily increased the cost of coke at the Hanyang furnaces at Hankow. A recent report from the collieries of the Han Yeh Ping Co. stated that coal was costing $10.08 gold (Tls. 4.00) per ton delivered at the coke ovens. If this report is correct, coke will cost at least $15.00 gold per ton at the ovens, 300 miles from the furnaces.

While such high costs may not be encountered at Lungyen, still it is reasonably certain that owing to disturbed conditions along the Peking-Hankow line and to the continual epidemic of labor unrest and banditry in that part of China, from which the coking coal comes, that coke cannot be made for less then $10.00 gold at the oven, and cannot be delivered at the furnace site for under $12.00 gold per ton, lower theoretical estimates notwithstanding.

From an analysis of the coal to be used by Lungyen, it is quite certain that the coke will contain nearly 20 per cent. ash and about 10 per cent. moisture when delivered at furnace stock-house. In other words, it will take at least 3,000-lbs. of such coke to produce one ton of pig iron using a 50 per cent. ore. Generally speaking under Chinese blast furnace practice, the coke cost in pig iron is between 50 per cent. and 55 per cent. of the total cost. Figuring on 3,000-lbs. of coke, which is not considered bad practice in China, the cost of coke per ton of iron will be $16.00 gold. On a 50 per cent. basis, this means a total cost of $33,00 gold for one ton of pig ex cast-house. Should this figure be approximated when Lungyen furnace is "blown in," it will mean that costs at this furnace are below those of any other "stack" in China, Manchuria included.

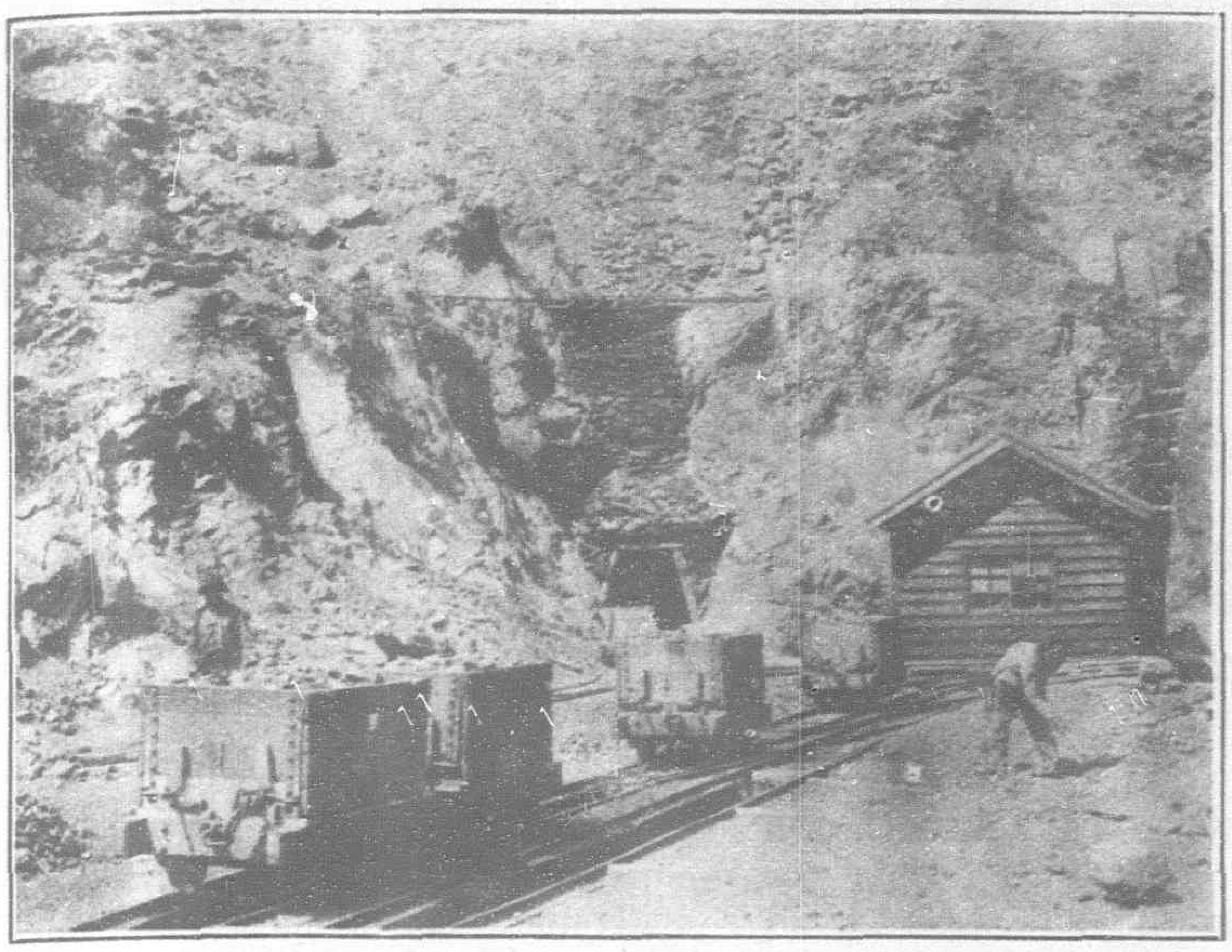
In order, however, to sell the entire output of Lungyen (90,000 tons) a price at Kobe of $38.00 gold must be quoted and this price must include a reasonable profit to the Company. Unless this price C.I.F. Kobe or Shanghai can be met profitably, it is doubtful whether the entire tonnage to be made at Lungyen can find a market. China has never taken much pig and at present is taking almost nothing. The imposition of *likin* or inter-provincial taxation, as well as export duties and charge, handicaps any furnace making pig iron in China. Adding these charges to railway and ocean freight, it is a question whether the difference in price at Kobe will be sufficient to ensure a Japanese demand. The Japanese are not going to favor Lungyen iron over Japanese or even Hankow pig. The Japanese have more than a market interest in the product of the Hankow furnaces and because of loans to the Han-Yeh-Ping Co. would naturally favor pig iron from this quarter.

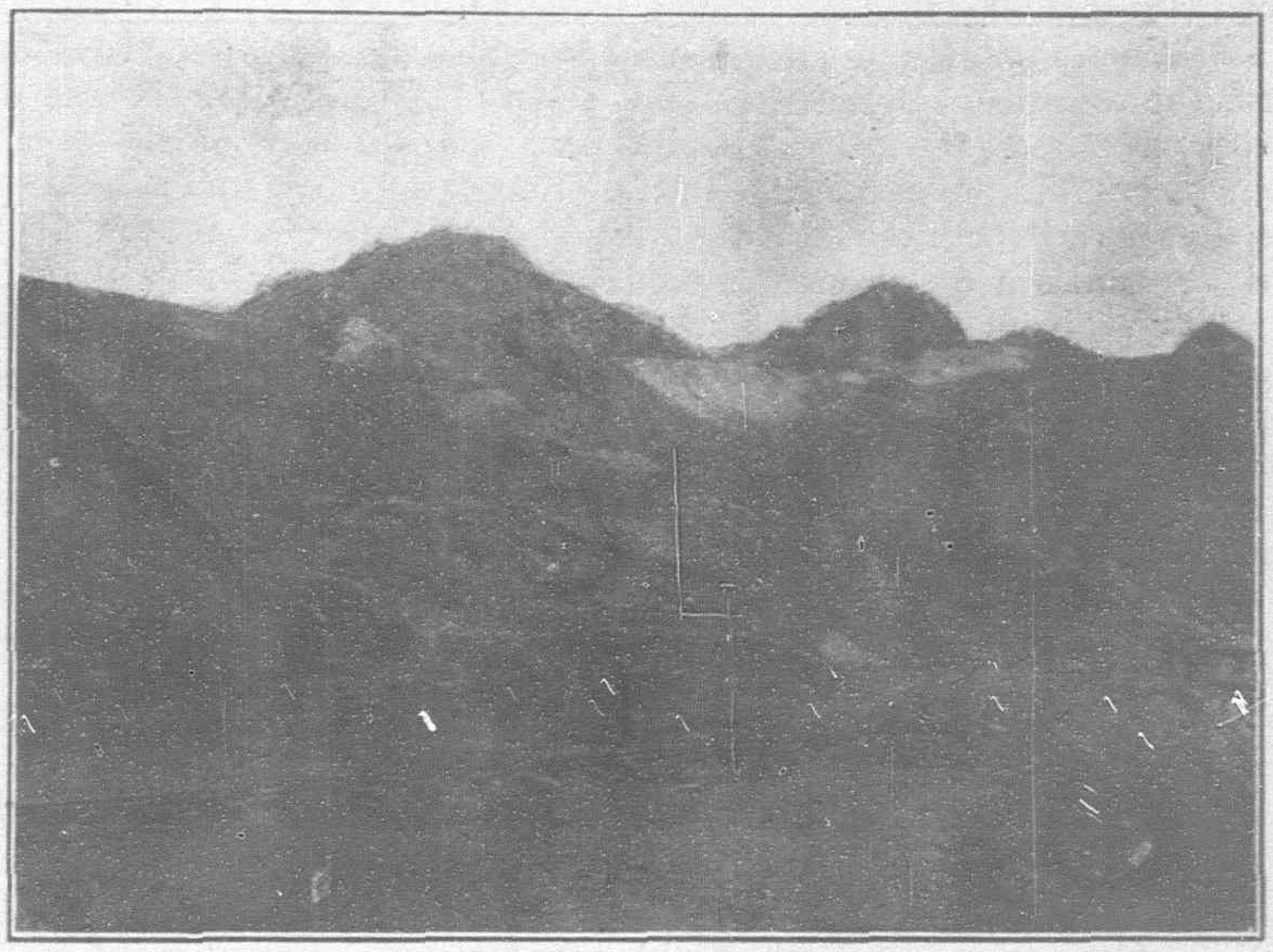
Unless capitalists taking over the Lungyen properties, are willing to put up enough money not only to operate the furnace itself but also to build a rail mill and a bar mill with the necessary steel mill units, it is not at all certain that Lungyen will be a financial success from an American standpoint. Putting up $2,500,000 Mex. may operate the furnace, but China cannot at present consume even the pig iron output of existing domestic furnace, and unless rails and bars or other shapes are made by the Lungyen Mining Administration, Japan will be the sole arbiter of price as regards the Lungyen product.

A large capital will be necessary to install and operate the openhearths and mills which will make Lungyen an independant unit, but if this capital is raised, there is little doubt that North China would take the steel products made. If possible an arrangement should be made with the Chinese Government Railways to take the output of such a rail mill at a price based on C.I.F. Shanghai figures for imported rails. In normal times the bars would find a ready market. From experience gained at other blast furnace plants in China, the only hope of successful operation lies in making finished steel, and even then costly supervision will not permit of any remarkably low costs.

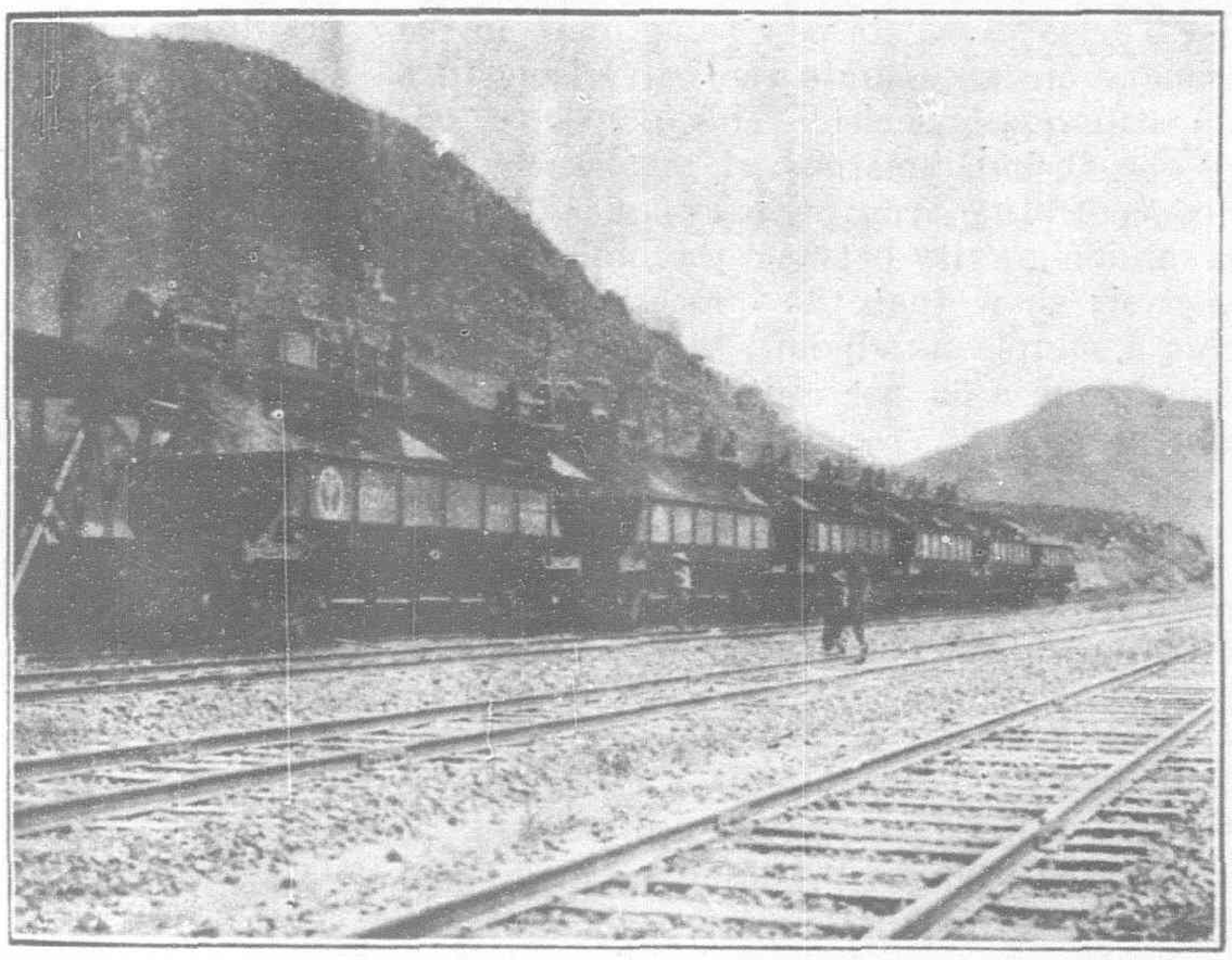
The Anshan Iron and Steel Works—Manchuria

The Anshan Iron and Steel Works are a subsidiary of the South Manchuria Railway, and are located at a well selected site on this railway about 60 miles south of Mukden. The Company is purely Japanese in capital and management and was started in 1917 along very ambitious lines. Two blast furnaces were immediately contracted for, each with a rated capacity of 230 tons per day. These two furnaces were to have been but the forerunners of a scheme which if carried out meant the construction of a plant comprising a

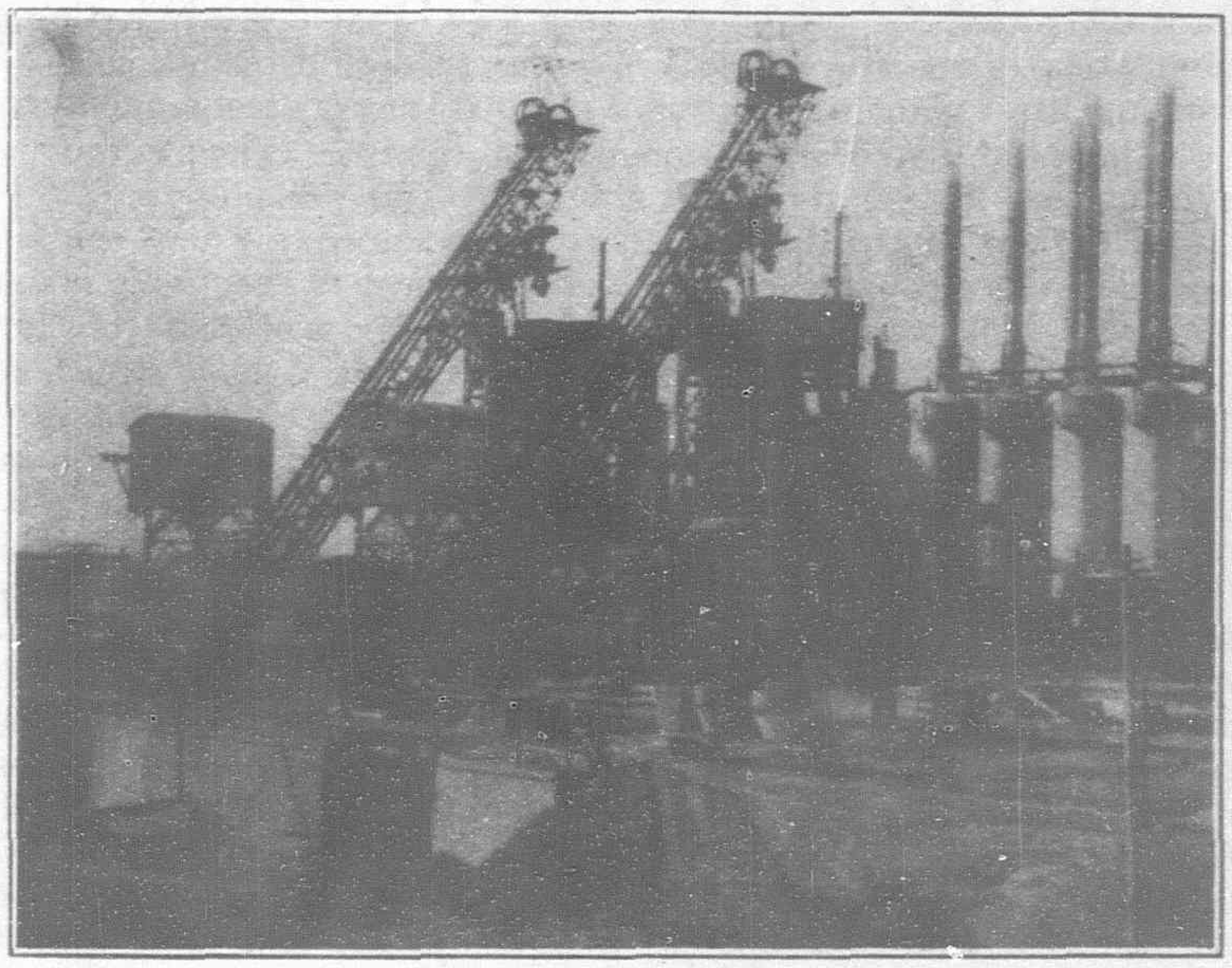




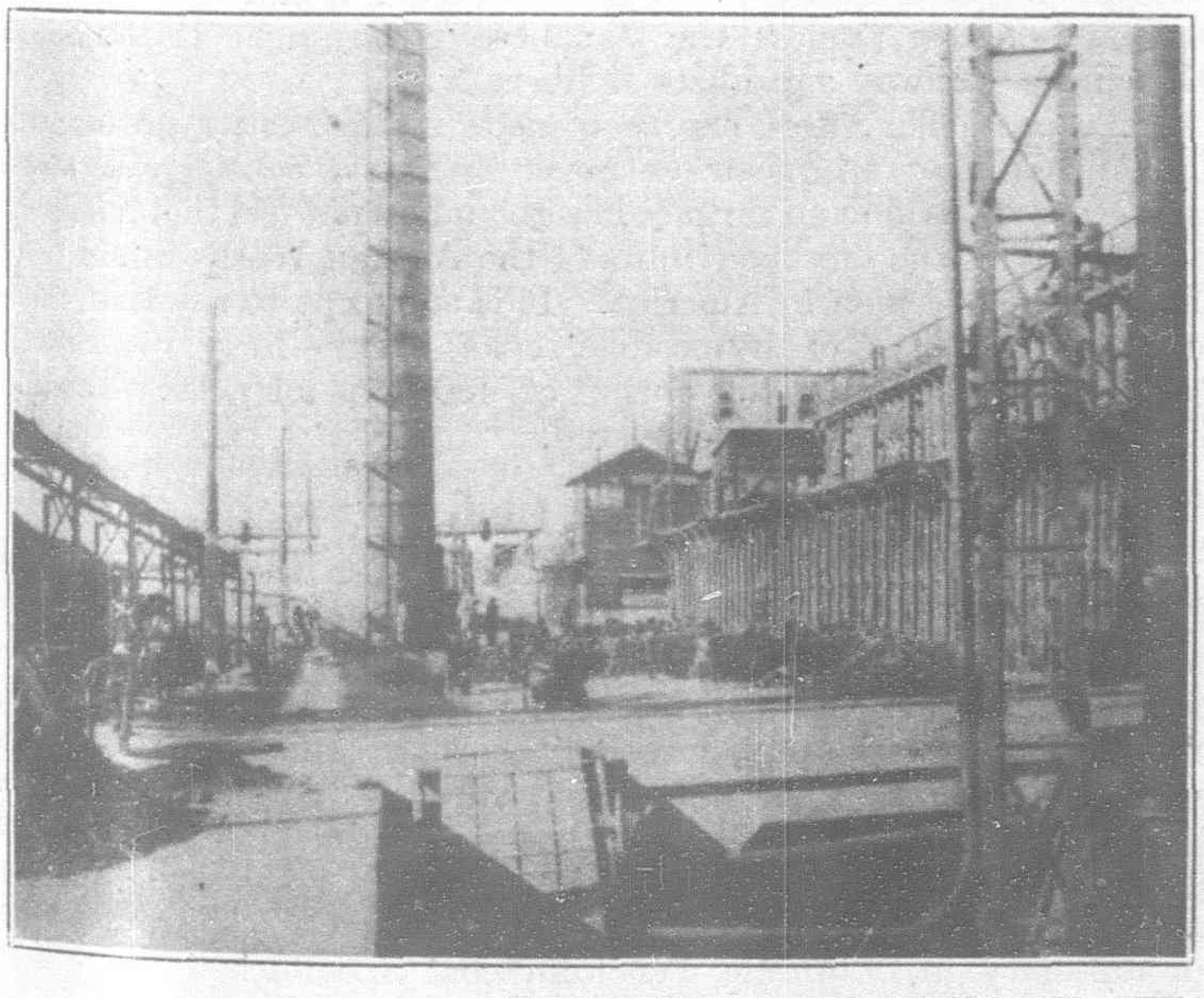
YINGTAOYUAN PIT, ANSHAN IRON MINES

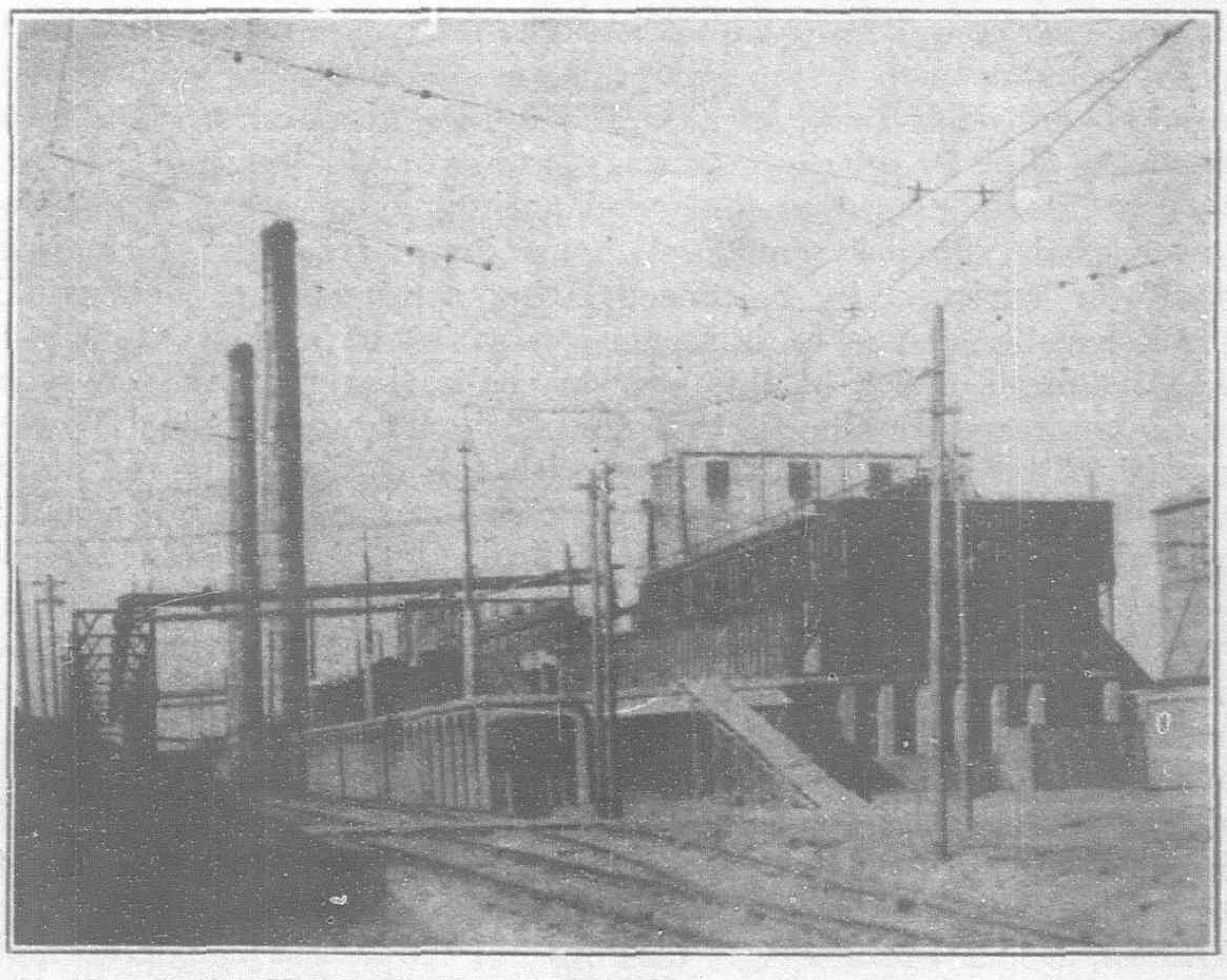


Loading Platform at the Takushan Mine of the Anshan Group



Anshan Iron Steel Works





TWO VIEWS OF COKE WORKS ATTACHED TO ANSHAN IRON STEEL WORKS battery of eight blast furnaces and a steel plant and mills capable of making 1,000,000 tons of steel per year.

When this plan was decided upon, millions of yen were provided for the establishment of the model town of Anshan near the site of the proposed works. Evidently the Japanese geologists and engineers were convinced that the ore, coking coal, and limestone so necessary for a plant of the proposed size was at hand and that it was more a question of finance and engineering ability than it was a question of raw materials. At any rate the first link in this ambitious chain for exploiting the iron resources of Manchuria was forged in May, 1917, when construction work started on No. 1 furnace. Simultaneously work was commenced on four batteries of coke ovens, a boiler house, power plant, stock house and the necessary auxiliary equipment for a plant of this kind. No. 2 blast furnaces construction was also started and every effort made to complete the first unit (two furnaces) of the scheme, as speedily as possible, so as to take full advantage of prevailing war and post armistice prices for pig iron. Just two years later on April 29, 1919, No. 1 blast furnace was " blown in." By this time a modern town with a population of 10,000 appeared in the model city of Anshan. Nothing was left undone to make this new Japanese town and plant a veritable Gary, Indiaua in embryo. The fact that but two of the eight furnaces were finished did not deter the management from anticipating the requirements which the town would have to meet later on when the other furnaces and steel works had been completed. Millions of yen were expended in making Anshan a city worthy of Japanese enterprise and one in every way capable of supporting a population of the size necessary for the successful operation of an iron and steel plant turning out 1,000,000 tons of steel annually.

Operation had scarcely commenced, however, when it became evident that high-grade ore in abundance was not present.

The facts of the case are that, while Manchuria does contain a considerable amount of iron ore and coal, most of this ore is under 35 per cent. metallic iron and the greatest body of coal (Fushun Colliery) refuses to coke. Of the 100,000,000 tons of iron ore controlled by the Anshan Iron and Steel Co. under its concession rights in the neighborhood of the town of Anshan, only a minute portion is suitable for direct smelting in a blast furnace. The ore, which up to now has fed the furnaces, is what is known as the " secondary enrichment " ore. It has been found in pockets here and there, but in such small and uncertain quantities that commercially it has proved very unsatisfactory. This " enriched " ore averages about 50 per cent. iron and has a hardness above 6. At the present time there is not enough of this 50 per cent. ore left, or in sight, to supply the two blast furnaces already erected. Consequently the directors of the Anshan Company were forced to abandon their original program and to curtail operation even on the furnaces now forming the first completed unit of the plant —namely Blast Furnaces 1 and 2.

It is stated that over $20,000,000 gold has been expended on the town of Anshan and the present plant. Most of this money went into the town and auxiliary equipment, because it was thought at first that it was only a question of a few years before a mamoth plant would be in operation and if this were to be the case such money would be considered well spent. The sudden awakening to the fact, however, that 50 per cent. ore was not to be had for long and that further profitable operation depended entirely on whether or not the lower grade (35 per cent. ore) homatite-quartz-schist formation could be enriched by a concentrating arrangement that would prove feasible, caused an immediate cessation of further extensions. The resultant effect of this sudden realization that the ore was of no commercial value, is that the Anshan Iron and Steel Works consist of but two blast furnaces with the necessary power plant and coke ovens, and of an unproductive town some 60 miles south of Mukden on the South Manchuria Railway. As the plant stands to-day it is a failure not only financially but matallurgically. The blast furnaces were not properly designed and No. 1 Furnace is now being rebuilt from hearth to charging platform in an endeavor to overcome certain operation troubles that precluded successful working when the furnace was in blast. Owing to the character of the ore and the coke, it is necessary to maintain a very high temperature on the other furnace now in blast in order to operate at all. The slag volume is tremendous. When the writer visited Anshan, No. 2 Furnace was making but 120 tons of pig per day and this iron averaged about 3 per cent. silicon. The natural conclusion was that the management was getting ready to " blow out " the furnace. When the writer, however, asked the blast furnace superintendent if that were the case, the latter replied very frankly that it was necessary to make " hot " iron in order to run at all. Such iron, of course, would be useless in an openhearth furnace on account of the high silicon content.

Concentration of Ore

As stated above the great mass of iron ore around Anshan is a low grade primary ore without secondary enrichment. It contains about 35 per cent. iron and is very hard. This hematite-quartz-schist possesses scarcely any commercial value and, if it is to be used at all, must be concentrated and brought up to about 60 per cent. metallic iron. The specific gravity of this primary ore is 3.5 and its perosity is about 10 per cent. Generally speaking the hematite particles are slightly magnetic and where they have come in contact with granite are highly magnetic, being reduced to magnetite.

At present, investigations are proceeding at Anshan with a view to concentrating this ore by means of concentrating tables and by magnetic separation. A committee of eminent American geologists from Minesota has looked into this subject quite exhaustively and while the report of this committee is not public property, nevertheless it is understood that the report prepared was favorable as to concentration. The feasibility of this concentration may not be denied, but it is a question whether or not the additional cost may not be too severe a burden for commercial success.

The experiments now being made in the concentration of this primary ore necessitate the palverising to 65 much or less of the homatite-quartz-schist. This powdered ore is then concentrated by the Gründal method of magnetic-concentration, coupled with a concentrating arrangement that takes advantage of the difference in specific gravity between the homatite and the quartz in the ore. Analysiz show that this process is partially successful (at least from a sample standpoint) the primary ore being mechanically enriched from a 35 per cent. iron content to about a 60 per cent. content.

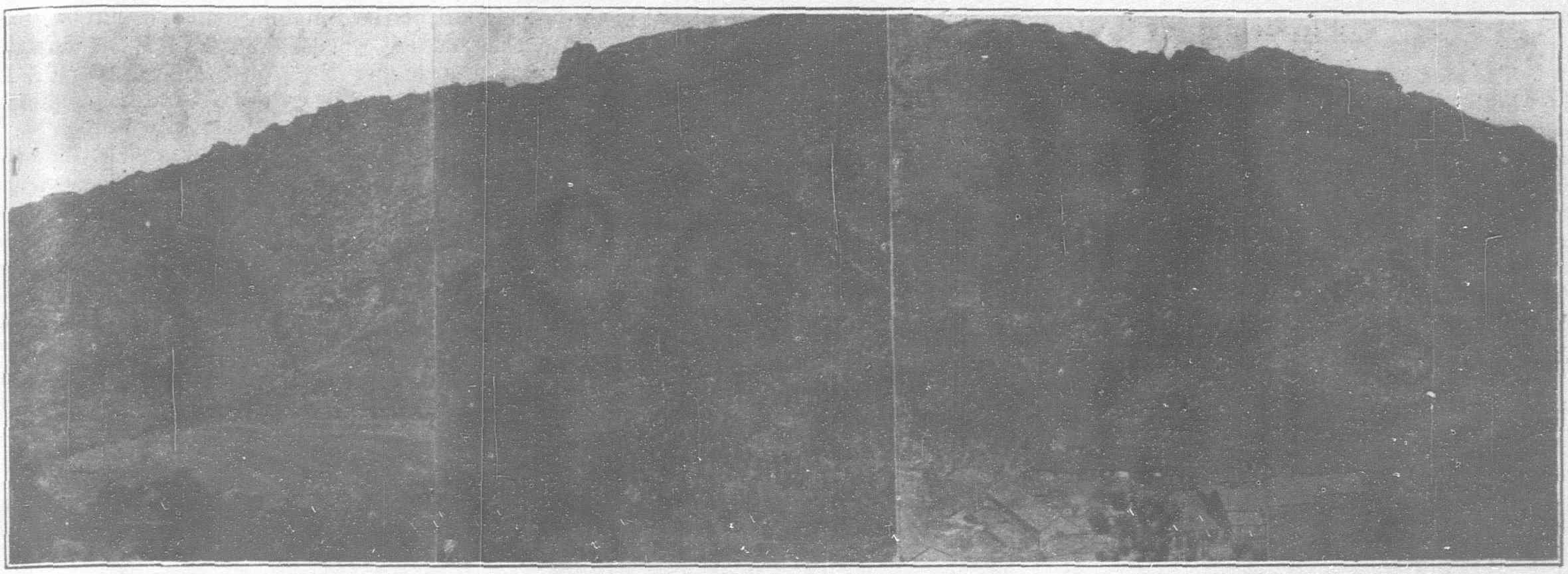
Cost of Pig at Anshan

It is very difficult to obtain a figure on cost per ton of pig iron at Anshan, because there are so many extraneous items entring into costs there which are really not proper charges against operation, although, of course, they have to be met. If we consider only raw material, fuel and labor expense as making up the manufacturing costs of pig iron at Anshan, we can state that it is 70 yen or $35.00 gold per ton. If, however, other charges, such as interest, town expense, depreciation, relining, and ore concentration, are included, it is possible to put the cost per ton of product up to almost any figure, because one furnace is idle and the other is producing but 120 tons per day. With an investment of $20,000,000 gold and a production of but 45,000 tons of pig a year, it is seen that the plant is already a financial failure and that even with a successful outcome on the question of ore concentration, it can hardly become a great producer, unless the Japanese government or the South Manchuria Railway subsidizes it liberally.

No particular effort has been made in this article to describe the Anshan Works in their entirety. We laid considerable stress on the ore situation and furnace design and do not feel that a lenghty description of the auxiliary units of the Anshan Works would be of interest to steel men in America. It is sufficient to say that there are four batteries of by-product coke ovens—forty ovens to a battery—with a total daily output of 480 tons of coke. Tar and sulphate of ammonia are recovered.

Coking Coal

It was originally thought possible to use the coal from the Fushun Colliery near Mukden for coking purposes. This Colliery belongs to the South Manchuria Railway. It operates one of the most extraordinary seams of coal in the world (1,000,000,000 tons in sight). Unfortunately, however, Anshan cannot utilize Fushun coal because it is of the non-coking variety. Anshan ovens have to resort to Penchihu coal, a fairly good coking coal mined about 120 miles from the plant and belonging to a rival Sino-Japanese concern known as the Penchihu Coal & Mining Co. There has been no difficulty in obtaining Penchihu coal in sufficient quantities, because the demand for coke at Anshan has been very limited on account of the restricted operations.



Panoramic View of the Mid Portion of Lushan Mountain. In the Foreground to the Right, is a Group of the Main Buildings of the Tsaoyuen Gold Mines Company, Tsaoyuen, Shantung Province. Looking West.

Gold Ore Deposits of the Linglungshan Region, Tsaoyuen, Shantung

By Y. Tsenshan Wang

Part I

General Geology

THE information contained in this paper was obtained by the writer in the Spring of 1917, while engaged in a mining reconnaissance of the gold fields of East Shangtung. The writer is under obligations to the officers of the Tsaoyuen Gold Mines Company, particularly to Mr. Li Tse-kao, the superintendent, for valuable informations and for facilities extended during the execution of this work in and around their mines in the Linglungshan region.

Scope and Purpose of the Work

In this paper are discussed very briefly the geologic conditions in and around the Linglungshan region as far as they are known, while the results on the economic side are described in comparative detail.

As no topographic map of any kind was accessible at the beginning of the work, one of first undertakings was the preparation of a suitable topographic map. It was also necessary to make a preliminary study of the geologic relation of the rocks of this gold producing region for the purpose of determining the nature and extent of the ore bodies, and ascertaining if geologic work of value to the gold miners could be done in advance of actual mining.

Field work for topographic and geologic mapping was carried on almost simultaneously as the geological structure is not very complex. (The lack of a suitable map at the beginning of the work made it necessary for the writer to run stadia traverse and level lines over much of the area beyond the productive hills, as indicated on the accompanying geologic map.)

Geography

The area described in this paper occupies principally the Linglungshan and Lushan ranges, which run northeasterly, and almost east to west respectively, and are separated by the main traffic road between Whang Hsien to the north and Tsaoyuen Hsien to the southwest. It extends to a subordinate degree into the immediate ranges to the north east of Linglungshan, for a distance of not less than 15 *li*. Both Linglungshan and Lushan are situated northeast of the city of Tsaoyuen, in the northern part of the peninsula of Shantung. For convenience, the name of "Linglungshan region" will be used in this paper to designate the producing areas in the district of Tsaoyuen. The south end of Linglungshan and Lushan ranges merge into a valley developed by the river running from south to northwest. The land along this valley is thoroughly cultivated. Their northern ends of the ranges are, however, joined by higher or lower ranges and most of their slopes are equally utilized for agricultural purposes. The Linglungshan range and Lushan range, particularly the former, serve the principal portion of the area in which ore-deposits have been developed, though the mining camps may be at present found even outside of this area. As far as the Tsaoyuen Gold Mines Company is concerned, the mining has been carried on mainly in the hills of Linglungshan and subordinately in some of the lower hills in the Lushan range and in the hills of the Pudekong Kohsenken system. The main buildings of that Company are at the foot of the mid-portion of Lushan, from the top of which a comprehensive view of the mines may be obtained.

The area in which ore has been produced is 15-20 *li* north and northeast of Hechiachong, and at an elevation of 150-250 metres above the sea level. The wagon road or the main traffic road, leading to the Tsaoyuen Gold Mines Company's property from the southwest, and to Whang Hsien on the north, has a moderate grade for most of the distance, but is very steep near the camp. The haul from the camp southward is almost entirely down grade, but northward for not less than 1½ *li* is upward until after passing the divide of Fensailing the road is again down grade.

The top and the upper level of the ranges support no growth of cedar and other scrubby trees, but these are available, as fuel supply, on the lower part of the slopes.

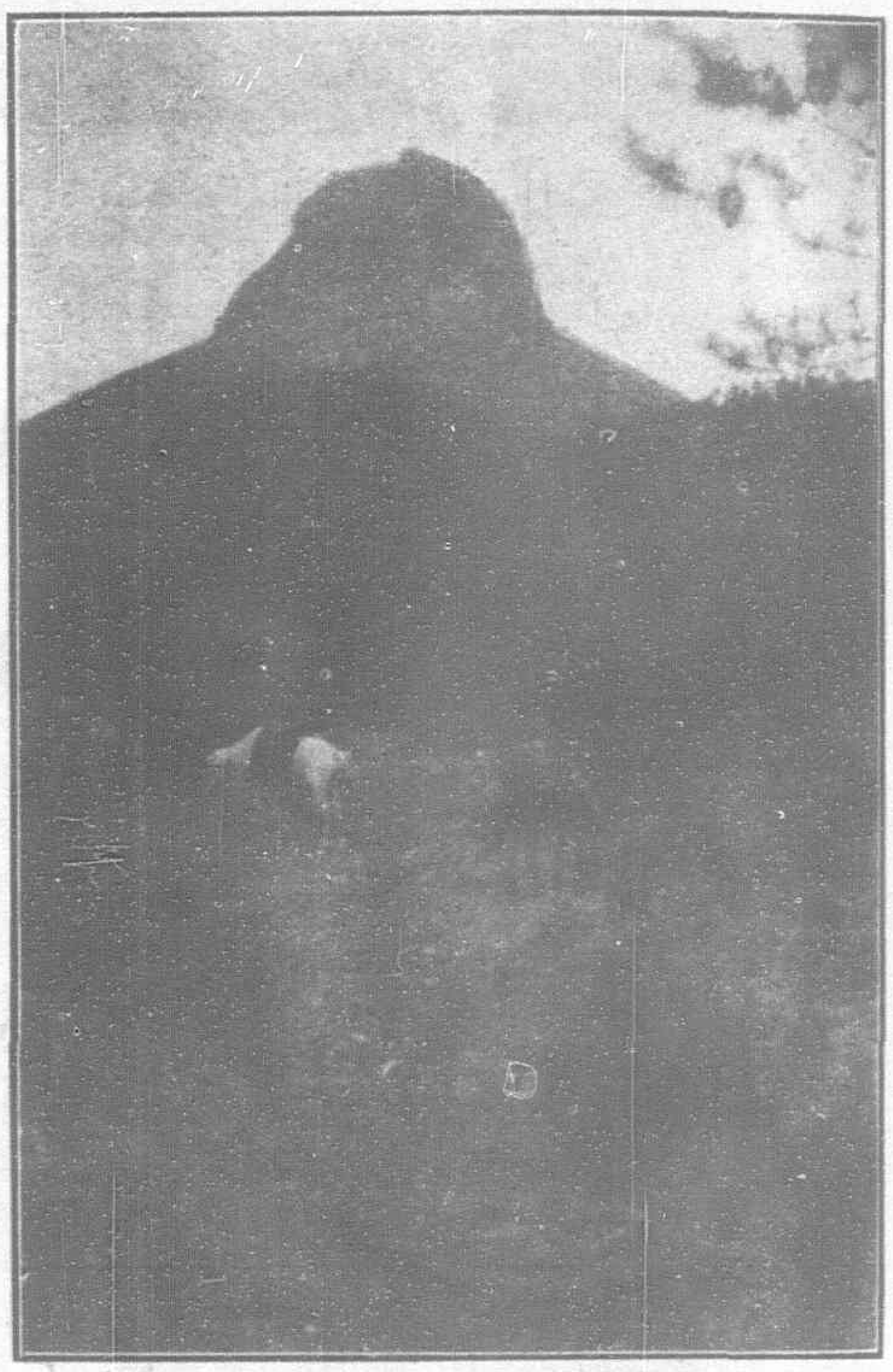
There are several springs near the camp. The most notable one is on the southwest side of the main buildings of the mining company. The water, issuing from a small fissure in pegmatitic granite on the east slope of Lushan, is extremely good and is used for cooking and for all other purposes. It is usually allowed, by means of iron pipes, to run into an open reservoir situated at the foot of a lower hill near the camp.

Physiographic Features

The area in which the Tsaoyuen gold mines have been developed is wholly different from the regions to the south, southeast and southwest of the mining camp regarding topography. The valleys are peculiar in extent and arrangement. Lowlands penetrate far into the mountainous areas. The river beds are floored either with granitic sand or with irregular fragments of granites and gneisses. Mountains occur as isolated groups and seldom in well defined ranges, their altitudes varying with every individual group. The highest peak, Lushan, to the west of the present main camp, is 375 metres above the camp ground. Other consipcuous heights very from 100 to 300 metres and there are many lower hills isolated in different parts of the area under consideration. This area represents probably one of the mountainous districts in the northern part of Shantung. Plains: The only lowland of the region is about 8 *li* south southwest and 35 *li* northeast of the Tsaoyuen gold field. The regions to the east, north and west within a distance of 20-30 *li* are more or less hilly, if not highly rugged. So properly speaking, there is no plain in the immediate neighborhood in these directions.

The southern limit of the Lushan Summit, showing both the rock talus and a portion of the wall, extends to the summit. In this picture is also indicated the difference in hardness of the gneiss as revealed by the effects of weathering and corrosion.

A Rock Ravine to the west of Hungtsinpeh. The gneissic granite at the back is badly jointed.



An oviline basalt neck intruded into a gneiss. The neck has a circumference of more than one li, and its height is not less than 450 feet between the point D. and its summit.

Drainage.—All the streams and rivers were dry at the time of the writer's visit, and they are without exception floored with sand or full of angular rocks of all shapes and sizes, igneous and metamorphic. They are in some cases very wide, from 10 to 100 or more metres. They are known as Soho. But about 1-2 feet below the surface, the water is always present, and during the rainy seasons of the year, these rivers are generally covered with a sheet of water. Its depth and its continuance is commonly controlled by the amount of rain and the duration of the rainy season. If the rain comes in intermittent showers, the water in these sandy rivers may disappear soon after the rain stops.

The water which is required by the milling in connection with various processes of gold washing, is wholly drawn from a spring, on a hill side just at the back of the main buildings of the Company, and from the tunnel No. 1. The water from the former is purely a spring water and is also used for cooking, but that from the latter is used only for milling purposes. The last mentioned water is undoubtedly meteoric in origin, and seems to have thoroughly circulated in the upper part of the Linglungshan range in question. This is indicated by the fact that when a lower level is cut the water gradually disappears in a higher level just above. it. Mr. Li, the manager and proprieter of the Tsaoyuen Gold Mines Company, has informed the writer that at the time when the tunnel No. 7, which is above the tunnel No. 8, was cut, there was plenty of water in the rocks on the first mentioned level, but within a short time the rocks gradually became dry and at present there is hardly any water. The walls in the upper tunnel are more or less wet indicating that the water is running off in its downward journey through the cleavages and fractures in the wall rocks.

As to the supply of water for the people in general, it is all drawn from their wells which can be found almost within every individual compound. This is also true all over the entire north eastern part of the province of Shantung, which the writer had the opportunity to visit in the spring of 1917.

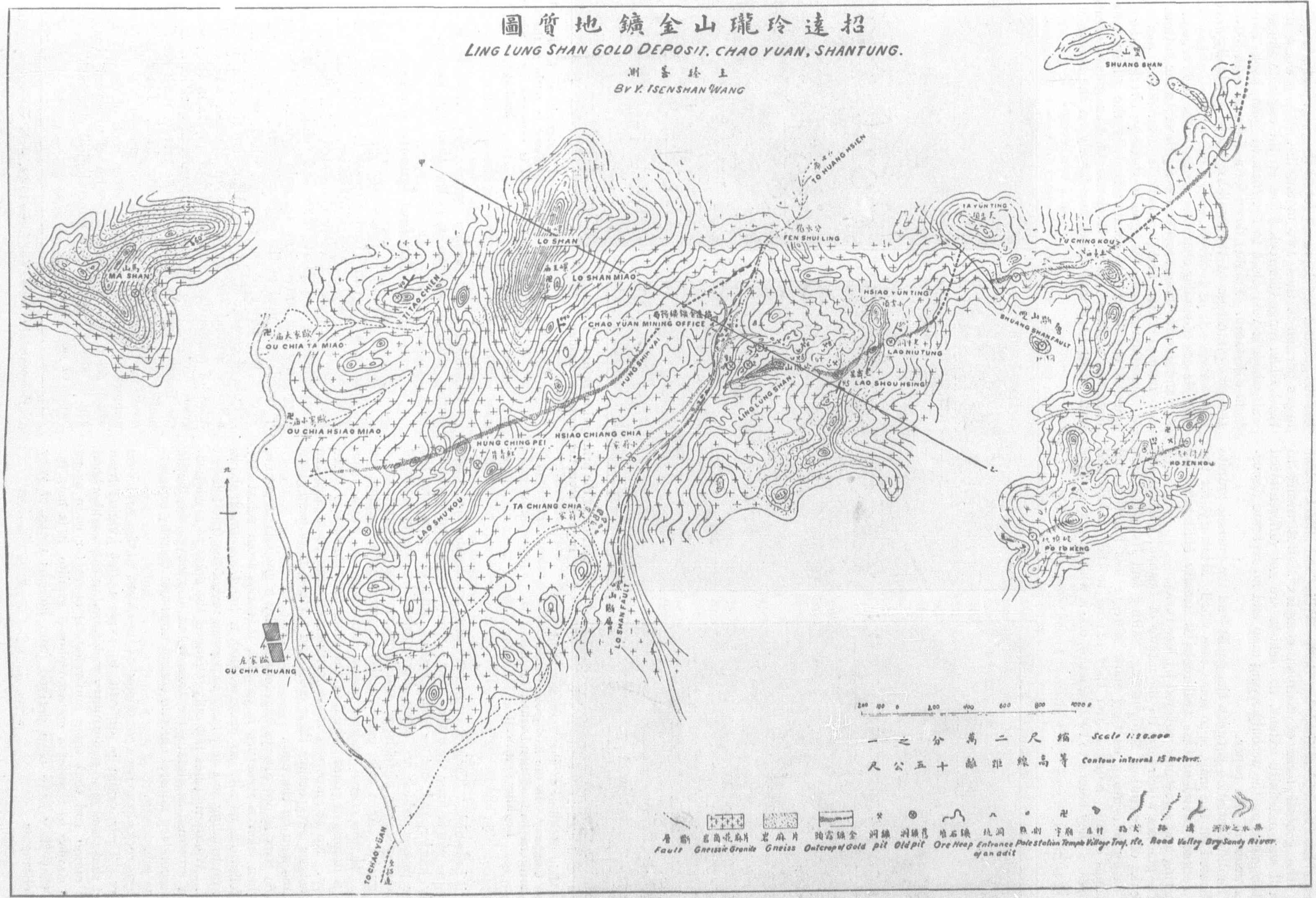
Geology

Igneous and Metamorphic Rocks.—The rock formations of the Tsaoyuen gold field may be divided into two very distinct groups. One comprises a variety of ancient and metamorphosed rocks, which form a large part of Lushan and Mashan mountains and some of the hills to the northeast of the present main camp, and of the hills to the east of Linglingshan. These rocks originally occupied the entire area under consideration.

In Pre-Cambric or rather in Algonkian time, as a part of the second great volcanic activity manifested in this general region and elsewhere in the province, a number of volcanos probably from various centres, broke through these fundamental rocks which are undoubtedly Archaean in age. The products of these volcanos, which are more or less similar everywhere in this region, together with a minor occurrence of a darkish green rock of aphanitic texture, constitute respectively the second and third groups of the ancient igneous rocks.

I. Ancient Netamorphosed Rocks

Gneiss.—The rocks of this division may be divided into two varieties, schists and gneiss, each distinctly recognizable in the field, but the former occurs only sparingly. In general, they



招遠玲瓏山金鑛地質圖

LING LUNG SHAN GOLD DEPOSIT, CHAO YUAN, SHANTUNG.

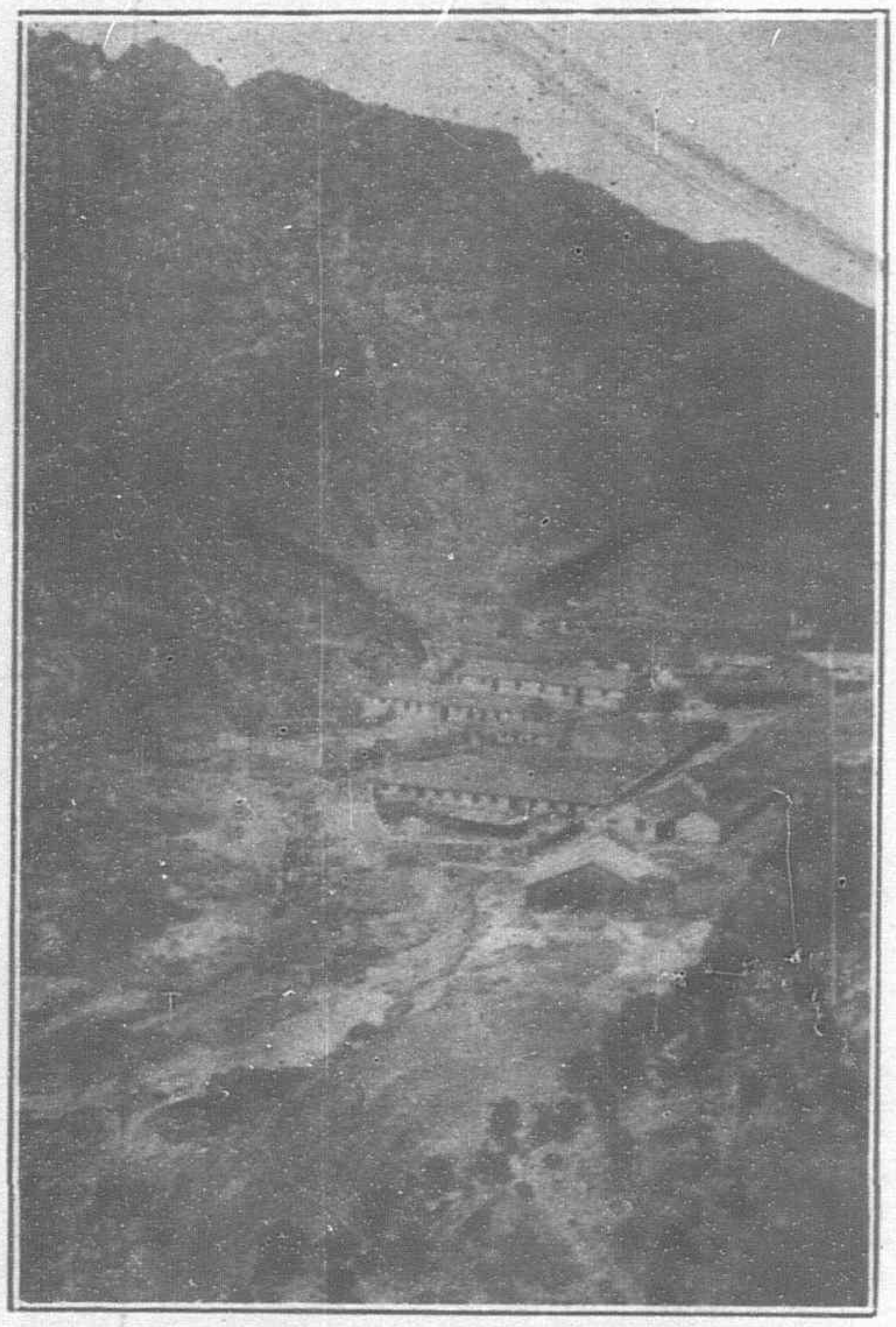
王臻善測

BY V. ISENSHAN WANG

strike S. 30 W. with a dip of 45-65 to northeast. Their general character has been described by Baily Willis and Blackwelder under the general term of Taishan complex*. But owing to its small and indefinite extent, the schists are not differentiated from the gneiss on the accompanying map and no separate discussion is made in this paper.

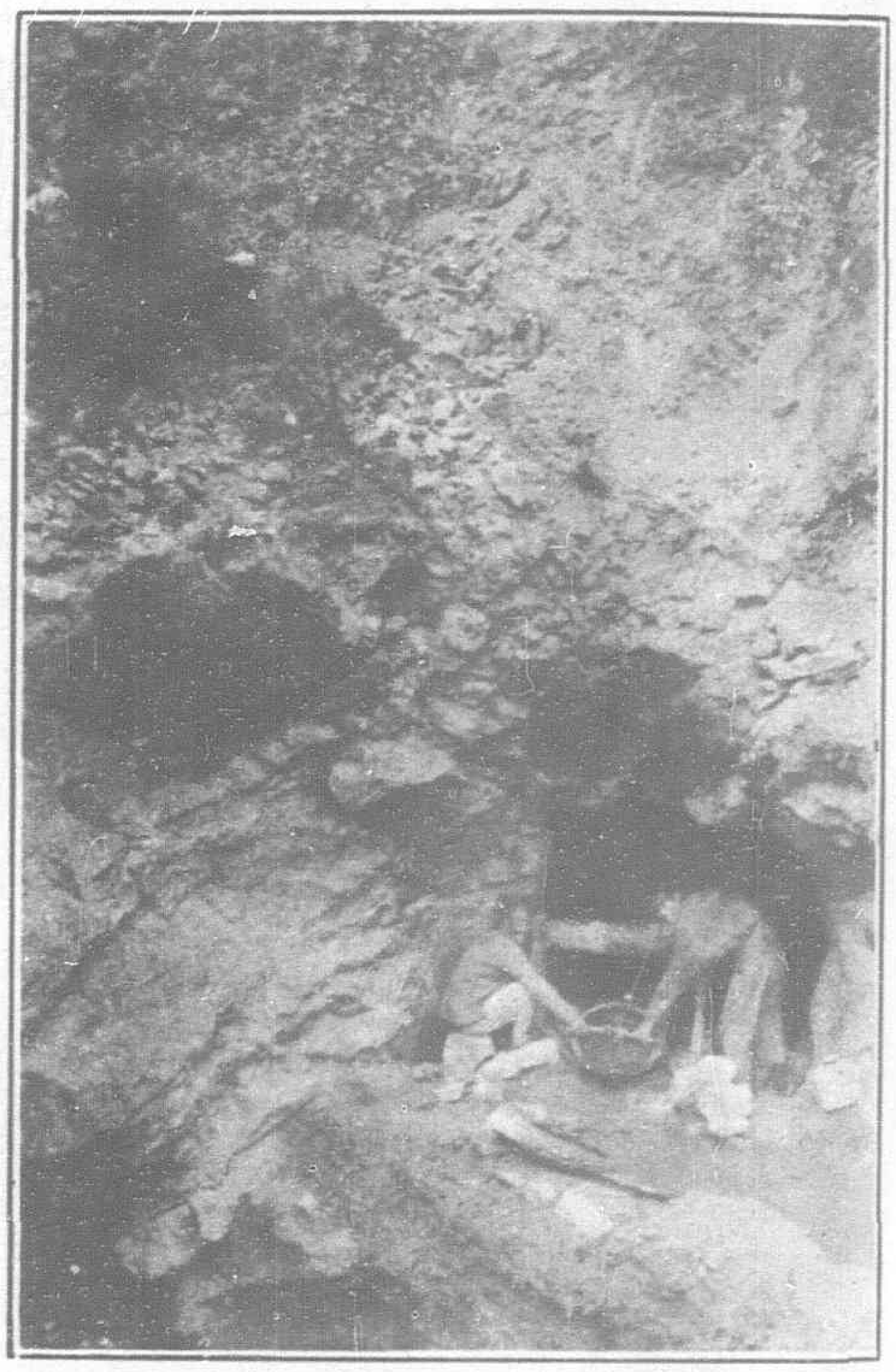
The differentiation between the gneiss and the gneissic granite as indicated on the map, is in some case wholly arbitrary, for the exact contact between these two rocks is usually obliterated by weathering and sometimes covered by lose rocks.

The gneisses which form the mountains of Lushan, Mashan and the peaks of Dayinting, Siaoyingting, Saiting and Hsanshan, are most easily recognized, as they show more or less foliation and sometimes distinct banding, and they expose to the surface and on slopes. They belong to two varieties, one is whitish-gray and the other is brownish. Their texture may also be divided into two classes, as one is finer than the other. The finer grained gneiss is usually harder and not so easily broken into pieces as are the coarser phases, which are often characterized by the presence of numerous eye-spots of feldspar and large crystals of quartz as a grano-gneiss. As a rule, most of the gneisses in this region are coarse. In the coarse grained gneiss, muscovite or white mica forms a dominent part, while in the finer ones biotite is more common. No attempt was made in differentiating them and the two gneisses, irrespecting their color and texture, have been given the same sign on the map.



The Main Building of the Tsaoyuen Gold Mines Company. In the background shows the northern half of the Lushan summit. Looking southwest

A portion of the principal workings. Looking east from the summit of Lushan



A vertical water pit at Koshenkeh. The water is allowed to settle at the bottom of the pit and is removed by a windlass and bucket

The rock is not always characterized by a gneissic structure, but when such a structure is present, it varies from schistosity to a foliation, usually so massive that a hand specimen shows almost no banding and only large exposures reveal the true foliated nature. Weathering has not only changed the color to a whitish-gray or brownish as already mentioned, but also leaves the biotite or the secondary mineral chlorite conspicuous and thereby exaggerates the schistosity.

These rocks have been considered as the oldest in the Archaeau complex. Their origin is difficult to explain, but judging from the fact that there is no sedimentary rock found in the neighborhood of this region and that their mineralogical character is in every respect similar to that of a metamorphosed granite, it is here inferred that they have been derived from igneous rocks of very acidic character.

Moshan and Lushan Gneiss.—The type of the gneiss which has the greatest development, forms the ridge and a large part of the upper portion of these two mountains. Along the central part of the Lushan range this rock forms on the east side almost a vertical wall which is very close to the form of " hog back " when viewed from a distance. Farther down for a distance from 100-150 metres, the precipitousness of this wall-like slope gradually becomes less and less.

Masses of similar character occur on the hills around the camp site and in some cases are seen clearly down to the bottom of deeply cut ravines. The best contact is seen along a deep ravine at Liusaiken where the gneiss directly overlies the Liusaikeh granite, the latter has been utilized by the villagers for making domestic grinders. The thickness of this gneiss varies greatly with different places, depending largely on the height of the hills or mountains. In Lushan range, the thickness is about 220 metres, while in Mashan, it is less than 180 metres.

II. Ancient Igneous Rocks

Gneissic Granite.—Below the gneiss lies the reddish gneissic granite, which varies from a coarse to a medium grained variety. They are composed chiefly of othoclase, quartz and biotite without accessory minerals. Closely connected with the gneissic granite, are pegmatitic and quartz dikes and veinlets in the gneiss system, suggesting the antecedent tectonic course of the region. It is believed that most of the pegmatitic and quartz veinlets or dikes were a late phase of the eruption which produced the masses of granite of gneissic structure in Algonkian time, for in several places, notably around the mountains of Mashan and Lushan, typical dikes of pegmatitic character and of quartz in the gneiss, seem to grade directly into the gneissic granite in question. In some cases the fissures and fault-planes in the granite itself are filled by pegmatite and particularly by quartz dikes. Later than these last mentioned intrusions, the gneissic granite was intruded by innumerable dikes of a darkish green rock of densely fine texture, which range in width from a few inches to several tens of feet, and which, according to their mineralogical composition, are olivine-basalt or dolerite.

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*Research in China, Vol. I, pp. 19-21.

Dolerite.—This group of rocks is represented by numerous dikes. They commonly occur in gneissic granites and run parallel to or cut across the quartz dikes[*]. In fresh conditions, this rock is extremely hard, but when it has been subjected to the actions of percolated waters from above, it is thoroughly disintigrated and decomposed and in some cases appears as a soft and darkish thick mud. It appears to be of much economic importance in this district. as will be pointed out in the section devoted to the ore-deposits. Nearly all these These dikes are found in practically all the workings at all elevations, but they have not been found to appear at the surface. They can be studied to particular advantage on every level in the mines, their green or darkish green color and aphanitic texture contrasting strongly with the quartz and granitic rocks. In some case the remarkable irregularity of the dikes is clearly shown. They branch and coalesce; they swell and pinch out; they change abruptly in course and dip.

Magascopically it may be taken for aphanite. As seen in thin sections, the rock is essentially composed of plagioclase, pyroxene and olivine. It occurs in ophitic or trachytic structure. As accessory or occasional constituents, occur biotite and magnetite. The feldspar crystals, chiefly labrodarite, show strong tendency to automorphic with marked tabular habit, and exhibit twin-lamellation. They occur at times as phenocrysts. Augite occurs as phenocrysts, generally characterized by good crystallographic form, and also as more or less irregular grains in the ground mass, suggesting their crystallisation in two generations. The latter type previously occupies the interstices of plagioclase feldspars. The thin sections made from the specimens taken from various levels, show that this mineral has been completely sericitized. Biotite occurs sparingly in some specimens, but in others it is rather abundant. It is almost in all cases in lath shape and commonly occurs interstitially or included in some of the plagioclase feldspara. Olivine occurs as large and small phenocrysts, more or less idiomorphic and sometimes as small grains in the ground mase. They all seem sensibly colorless in ordinary light. When fresh it shows the usual irregular cracks along which alteration begins and in some instances shows an imperfect cleavage also. Generally it is in an advanced stage of alteration, the more noticeable product is serpentine. Zonary changes of this mineral in form of iron oxides, are also shown in several cases.

It is believed that these dikes are later than those quartz dikes mentioned above, as the former cut across the latter as seen in some of the workings. It is probably safe to say that these dolerite dikes are of late Algonkian age.

Structure

Folding.—That the rocks of the Linglungshan region have been thrown into numerous and complex folds and that the metamortphism of the gneiss or the Taishan complex is extreme, cannot be doubted. The strike in the main is prevailingly N.E. and S.W. with a dip varying from 46 to 65, mainly to northeast. In most parts of the region a dominent trend, which represents the axes of the principal folds, is recognizable and the minor strikes in various directions transverse to this trend are probably due to local flexuse or mark the ends of pitching folds. Practically speaking, no great folds are traceable for an appreciable distance, this is no doubt due largely to the probability of complex overthrusting originally involved as in case of the structures of the Laurentian in North America.

Faulting.—In the Linglungshan region the evidence of faulting may be considered as proved by the difference in altitudes or in certain topographic features. The relatively rapid erosion which took in the crushed rocks of the zone of fracture, which probably represents a fault line, has tended to develop the present stream valley which is partly occupied by the mining community. Furthermore the abrupt discontinuity and reappearance of ore outcrops and abrupt changes in dips in a short distance as observed in the workings at Hungzahyia are indicative to the presence of faults, though they are not clearly shown on the surface.

Joints.—The rocks of the Tsaoyuen gold field have been much divided into large and small blocks as the result of both anamorphism and katamorphism which they have experienced as described by Baily Willis in his work on the structural geology of Shantung[†]. Many examples of this kind occur just N.E. of the mining camp, where the striking peaks, like Siaoyinting and Hsanshanting, rise 120 or more metres above the valley, the masses of these pecks are composed of widely jointed blocks whereas the rocks in the valley are jointed much more intensely.

Part II

Economic Geology

General Mineralogy of the District

Minerals.—The number of minerals which are particularly common in the rocks in this mining area are:

Gold, silver, pyrite, chalcopyrite, oxidation products of copper, quartz, coless, sphalorite, orthoclase, laboradorite, albite, pyroxene, olivine, hornblende, biotite, hemetite, magnetite spricite, epidote, aptite, serpentine.

Notes on occurrence of some of the before-mentioned minerals especially those of economic importance:

Gold.—Within the oxidized zone, native gold of minute grains may be seen with unsided eye by grinding a pice of quartz rich is sulphides. The small particles of native gold in the sulphides of iron and copper are, however, invisible to the naked eye before the ore is crushed and washed with water. In a few cases spongy masses intermixed with the oxidized products of chalcopyrite or with the disseminated native copper, which was reduced from chalcopyrite by oxidation, say be distinguished with more or less difficulty. Examination of the ores of all classes, rich or poor, supposed free from oxidation, seems to indicate that the gold in all cases is free.

The so-called placer gold along some of the sandy rivers is either wholly won from the slopes of some of the productive hills or wholly carried down by the waters from the washings of the native milling camp, or composed of broken pieces from the quartz veins having decomposed and disintegrated by deep-seated weathering.

Silver.—Silver is commonly present with gold in the sulphides, especially the ores which are free from oxidation. No native silver has ever been found in this district, and from the fact that it is very rich in the ores in which copper sulphide predominates, it is inferred that the silver is probably chemically combined in a compound such as tetrahedrite though the presence of the latter has not been identified. The largest amount of silver found in the ore is 2.472 ounces per ton according to the analyses made by the industrial experiment station of this ministry.

Pyrite.—This mineral is the most common metallic sulphide in the district. It occurs widely in the quartz veins. It is commonly in massive form, or in veinlets, or occassionally in large, irregular masses. It is sometimes crystallized, showing cube or ostehedrons or a combination of both. Some of the pyrite veinlets are poor in gold or almost valuless as far as the gold content goes. Some of it is strongly cupriferous, as most pyrite veinlets show stains of copper carbonates as seen in different ports of the workings.

Chalcopyrite.—Next to pyrite, chalcopyrite is the most common metallic mineral accompanying the gold content. It is particularly abundant in some of the important veins such as those seen on the upper levels. The mineral is usually of dull yellow color and occurs as small masses with pyrite in the quartz veins. It is not know to form distinct crystals. In rich suriferous veins this mineral is usually covered with a coating of dull lead-gray opaque color, indicating oxidation. This coating is so thin that its exact nature is not determinable, but it is believed that the portion of iron sulphide chemically admixed with this mineral, is liberated under the influence of oxidation, leaving the copper in the form of chalcocite or cuprite.

The presence of this mineral in the ores especially when it shows the dull color mentioned above, is of great economic value indicating generally the rich content of gold. According to the analysis made by the industrial experiment station of this ministry, it shows that the amount of gold carried in the ores of cupriferous sulphides varies from 4.838 to 17.203 ounces per ton.

Oxidation Products of Copper.—Of the oxidized products of copper, the sulphates, chalcocite and bornite are most common. The latter two occur chiefly in the veins in which the copper sulphides are particularly rich, whereas the former occurs usually in cracks, or as a coating on some of the rocks in the workings, and it is never found in the veins which are free from oxidation.

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[*] These quartz dikes later became the centre of ore deposits and they are called quartz veins in discussions of the gold ore.

[†] Research in China, Vol, I, pp. 5973.

Quartz.—This is an important mineral in most of the rocks in the district. In constitutes a mass which occupies the major portion of the veins. The specimens taken from different parts of a vein and different veins all seem to indicate that some of the quartz crystals are of secondary origin and much of the larger crystals of this mineral have been distorted and fractured, and wherever this dynamic disturbance took place, secondary or granulitic quartz is present as a filling between the larger crystals of the same mineral. Most of them show strong pleochroism under microscope and they commonly show enclosures of minute crystals of quartz probably partly formed by recrystallization and partly deposited from the ore depositing-solutions as shown elsewhere in this paper.

Galena.—In some of the quartz veins galena occurs in very small quantities. It is commonly associated with iron sulphides in the veins in which gold is either poor or absent. It is therefore assumed by the miners that the veins in which this mineral is present, are not auriferous. Other occurrences of this mineral are in the quartz veins which do not carry pyrite. It is not known whether this mineral occurs at all depths, and it is not altered even within the oxidized zone.

Sphalerite.—This mineral has so far not been commonly found in the veins. The writer has been informed that it has been found in quartz, but he himself has never seen it in any part of the workings.

Orthoclase.—This occurs as an important constituent in all the rocks, such as gneiss, grano-gneiss, or gneissic-granite and pegmatitic granite in the district, except of course the dolerite dikes and basalt eruptions. It is seen, moreover, as a mineral of the veinlet-forming period in some of the fissures in gneiss.

Plagioclase.—They are chiefly represented by laboradorite and occur as principal constituents in dolerite dikes and in basalt rocks. Laboradorite is much less common than is orthoclase and albite, the latter usually occuring with the orthoclase.

Pyroxene.—This is represented by augite, and occurs in dolerite dikes and in the basalt eruption which forms the famous neck of Tsanshan 60 *li* east of the present mining camp.

Olivine.—This mineral is fairly abundant in those dolerite dikes which are commonly found in the mines.

Geologic Sequence

A period of fracturing and shattering : Long previous to the intrusion of granite which is now more or less in the form of gneissic-granite, the area was subject to very extensive diastrophism the compression being largely horizontal and probably extended in all directions. It was due to this great movement that numerous fractures or sheared zones were formed in the gneiss which overlies the genissic-granite every where, and it is not improbable that the gneiss was developed during the same period.

Following this period of extensive and great fracturing and shattering there seems to have occured a period of successive intrusions which do not appear to be very far apart from each other. These intrusions were first largely granitic and were followed toward the end of magnatic eruption, by the intrusions of pegmatitic granite and quartz veinlets and dikes. They filed every fracture in the gneiss as well as in the earlier part of granitic rocks. The grains of some of the pegmatitic veinlets are usually coarse.

Following these successive acidic intrusions, including those quartz dikes which are now regarded as quartz veins, and the period of their mineralization and replacement, there seems to have occured a separate and last period of volcanic activity, giving rise to the intrusion of dolerite dikes which are one of the common rocks in the mines.

These periods of intrusions were later followed by movement largely upward, which seem to have tilted northwestern Shantung toward northeast and which raised that part of the province probably not less than 2,000 feet.

History and Technology of the Gold Deposits

History of Mining Development.—The story of the discovery of gold in the district ot Tsaoyuen has hitherto not been summarized, though scanty information from various sources exists. The following sketch is a summary of a series of conversation between the writer and the superintendent of the Tasoyuen Gold Mines Company in the spring of 1917.

It appears that when the gold mines near Judien, in the district of Pingtu, Shantung, became unworkable below the underground water level, the late Li Tsoon-dai, father of the present general manager of that Company, started another search for gold with the assistance of the natives, in the hills of Lushan and Linglungshan on the strength of the historical facts which are mentioned elsewhere in this paper, * and on information furnished to him by the natives of that locality. In the course of desultory diggings, he found a vein on the southeastern slope below the Hunzahyia peak in the 16th year of Kwang Hsü of the Tsing dynasty. In the following year his attention was directed to the hills of the Linglungshan system on the east side of the narrow valley, and the first adit was driven at the foot of the south wing of Linglungshan. The entire work was then operated under the direction of an American mining engineer. In the fall of the same year they installed a milling plant of purely native character.

As soon as the true character of the ore body was ascertained the tunnelling work was rapidly pushed forward. In the next two years (the 16th and 17th years of Kwang Hsü) the tunnels Nos. 2-8 inclusive were cut one after another all of these being situated on the northwest slopes of the Linglungshan proper.

No complete record is obtainable as to the yearly production of gold under the management of the late Mr. Li Tscon-dai, who died in the 20th year of Kwang Hsü. He was succeeded by his second son, Li Tao-yuen, the present general manager of the Tsaoyuen Gold Mines Company. Under the management of this gentleman the Company was very prosperous in the 23rd and 24th years of Kwang Hsü, during which period the maximum production of 50-60 ounces gold per day was sometimes attained, while the production of 5-40 ounces gold per day was common. Thereafter, the production declined slowly and since that time till the present, the mine has not been operated to any further extent. The decrease in the production of gold dropped to an amount insufficient to cover their expenses.

This condition was to some extent due to the impoverishment of the veins, but the main causes must be attributed to the lack of capital and of proper knowledge of the deposits.

OUTPUT OF GOLD-ORE FROM 1912-1917 (INCLUSIVE)

	Ore in Catties.	Gold in Ounces.
1917	275,900 (Jan.-April incl.)	221.14
1916	1,292,490	686.81
1915	1 027,280	390.75
1914	775,820	443.98
1913	997,800	278.68
1912	514,580 (July-Dec. incl.)	108.26

The total dividends cannot be ascertained on account of the imcompleteness of the book-keeping and of the records on the profits received from the sub-mining parties operating in the region under contract as mentioned elsewhere in this paper. But for the year 1916, the dividends of the Tsaoyuen Gold Mines Company are said to have amounted to $50,000.00 as a net profit. This amount, in the company's opinion, is considered a very handsome profit.

It is interesting to know that Linglungshan produced about one-fifth of the total tonnage of gold for any year since the beginning of the republic. The investigation made is the spring of 1917, shows that 80 per cent. of the ore came from the hills of the Linglungshan system, 10 per cent. from Lushan system and 10 per cent. from Koshenkeh-Pudehkong system.

Investments by Foreigners.—As the company has had constant trouble in money affairs, the present manager and proprieter of the company made contracts with several parties of foreign nationality on different occasions, among which may be mentioned. The Macco & Co., of Chefoo since the latter actually sent men there to direct the work.

As far as the writer could learn from the present manager the contract was made between his company and The Macco & Co., in July in the first year of the republic of China. According to the contract, the foreign company was to finance his company for the continuation of its mining operations while the latter agreed, in return, to deliver a certain number of tons of ore of certain grade at a fixed price for an indefinite period of time. The contract was, however, soon cancelled on account of the quality of the ore received by The Macco & Co., which was below the profitable limit.

It has also been learned from another source that prior to the last mentioned transaction, the Tsaoyuen Gold Mines Company entered into a similar agreement with the Collbran Bostwick Development Company of New York. The latter is said to have spent a sum not less than $20,000.00 in these mines for underground surveying at different times. But the said contract was not sanctioned by the government until the early part of the 3rd year of the republic. This contract was, however, later cancelled by mutual agreement between the Tsaoyuen Gold Mines Company and the Collbran Bostwick Development Company of New York as the latter was unable to comply with the financial requirements of the contract.

In the fall of 1917, the Oriental Mines Company of New York became also interested in these mines. Mr. Wammer, a mining engineer of that company, visited the property in the early part of last fall, and he is understood to have made a very favorable recommendation. But the negotiation was dropped owing to the sudden departure of Mr. Finch, the resident manager of the Oriental Mines Company, for New York City.

Lately Mr. Li Tao-yuen of the Tsaoyuen Gold Mines Company has entered into two separate agreements, one with..........and the other with............... To the former he has contracted to sell 10,000 tons of his ore and a sum of $15,000 has already been paid him in advance; while from the latter he has received $80,000 in advance but the nature of that contract is not known to outsiders.

Mining.—The methods of mining employed by the Tsaoyuen Gold Mines Company are not materially different from those used in former times when the gold was first exploited. Over hand stoping is only occasionally used. Stulls of any kind are seldom used whether the veins are wide or narrow. No consideration is taken as to whether the wall rock is compact or hard enough for the stopes to stand unsupported. It may be noted that the disintegrated dolerite dikes at many places in the workings cause dangerous scaling off on the walls and is a consequence of this condition of affairs the roofs of some of the upper most levels have fallen at several points.

In general the ore is driven off by drifting which is conducted by making a number of chazel holes with long steel chazels in a desired portion of the rock by a number of men who usually work under contracts. When a sufficient number of chazel holes is made, the holes are filled with ordinary gun powder, and by its explosion the rocks are then broken, sometimes this requires a series of explosions. As soon as the smoke disappears the men return to pick out the ore, which is placed in the ordinary half ton-cars, and then, when filled are hoisted or rather pushed out on narrow tracks by the men under the same contract. The work of this group of men ends with the delivery of the ore or rock at the main entrance of a particular tunnel which connects with their respective levels. No electric or steam power has ever been used in this district so far the writer knows.

Sub-mining.—Besides the mining operation carried on by the company, there is another way in which the ore is exploited. The inferior ores or the gold bearing material rejected by the company after the rich portion has been sorted out, are sold to the nearly villagers or farmers. These ores are sold at seven or eight coppers per 100 catties. The treatment of these ores is carried on by the purchasers in their own "plants" and the methods of treatment is much the same as that used by the company as described elsewhere in this paper.

There is still another way of working this class of poor ores. The farmers are not required to buy the ore from the company, but extract whatever amount of gold they can get from it. This is divided in equal proportions between the company and the farmers concerned, on the basis that the company furnishes the necessary tools for the various processes, while the farmers furnish the labor.

(*To be continued*).

THE MANILA RAILWAY

(*Continued from page 405*)

No construction work is being done on any of these projects at the present time on account of lack of funds. Their completion means the life of the road. The construction of the line from Aloneros to Pamplona will connect up the Legaspi division with the main line south and will give through railroad lines from Tabaco and Legaspi in the south to San Fernando, La Union, in the north. This will make it possible for the Legaspi division, which is now a charge on the earnings of the Company of from P.450,000 to P.500,000 a year in unearned operating expenses and interest payments, to earn at least its fixed charges. A bill has been introduced in the legislature authorizing and directing the governor-general to subscribe for 70,000 shares of the capital stock of the Manila Railroad Company at par and to be paid for in yearly sums of not less than P.2,000,000; the sums so received to be used for the sole purpose of constructing the lines of road above specified. Its passage is assured and approval by the governor-general is hoped for.

Legislation

There have been submitted to the legislature for consideration during the present session the following measures :—

A bill authorizing and directing the governor-general to subscribe for 70,000 shares of the capital stock of the Manila Railroad Company, the funds so derived to be expended in the construction of certain specified lines.

A bill exempting the Railroad Company from taxation so long as it is owned and operated by the government.

A bill regulating the operation of motor-driven vehicles and providing taxation therefor.

A bill granting to the Railroad Company foreshore rights along Manila Bay, north of the Pasig River.

The passage of these bills seems to be essential for the economic prosperity of the Railroad Company. They all have the approval of the board of directors and their passage and approval by the governor-general is expected.

In the recommendations for new work it is believed that a considerable saving might be effected by the inauguration of single unit, gasoline railway cars for light passenger and package traffic on branch lines. If successful, a service of this kind might also tend to solve the problem of motor truck competition in the territory affected. The specific appropriation of a moderate sum to be used for investigating and experimenting along these lines is recommended.

General Improvements and Betterments.—During the past five years the funds available for expenditure have largely been put into the construction of new lines, and improvements and betterments and facilities for the economical and efficient operation of existing lines have suffered accordingly. Estimates made as to cost of various improvements, such as replacement of 45--lb. with 65-lb. rail, the substitution of permanent steel for temporary wooden bridge structures, acquisition of modern rolling stock, building of shops, locomotive sheds, stores, warehouses, and stations, amount to upwards of P.11,000,000. Better results might be secured in the carrying out of these projects by the sanctioning by the board of a definite plan or program, to be followed say for a period of five years.

THE MANILA GAS WORKS

(*Continued from page 406*).

other industries have also found gas to be a necessity in their line of business.

During the first years, before the general public knew exactly what gas was and realized its great advantages over other fuels, many hesitated to have it installed in their homes. The first consumers were mostly those who had live elsewhere and were acquainted with the advantags of gas service. However, the native population were quick to realize that gas was far superior to their primitive methods of cooking, and to-day 75 per cent. of the gas consumers are native born.

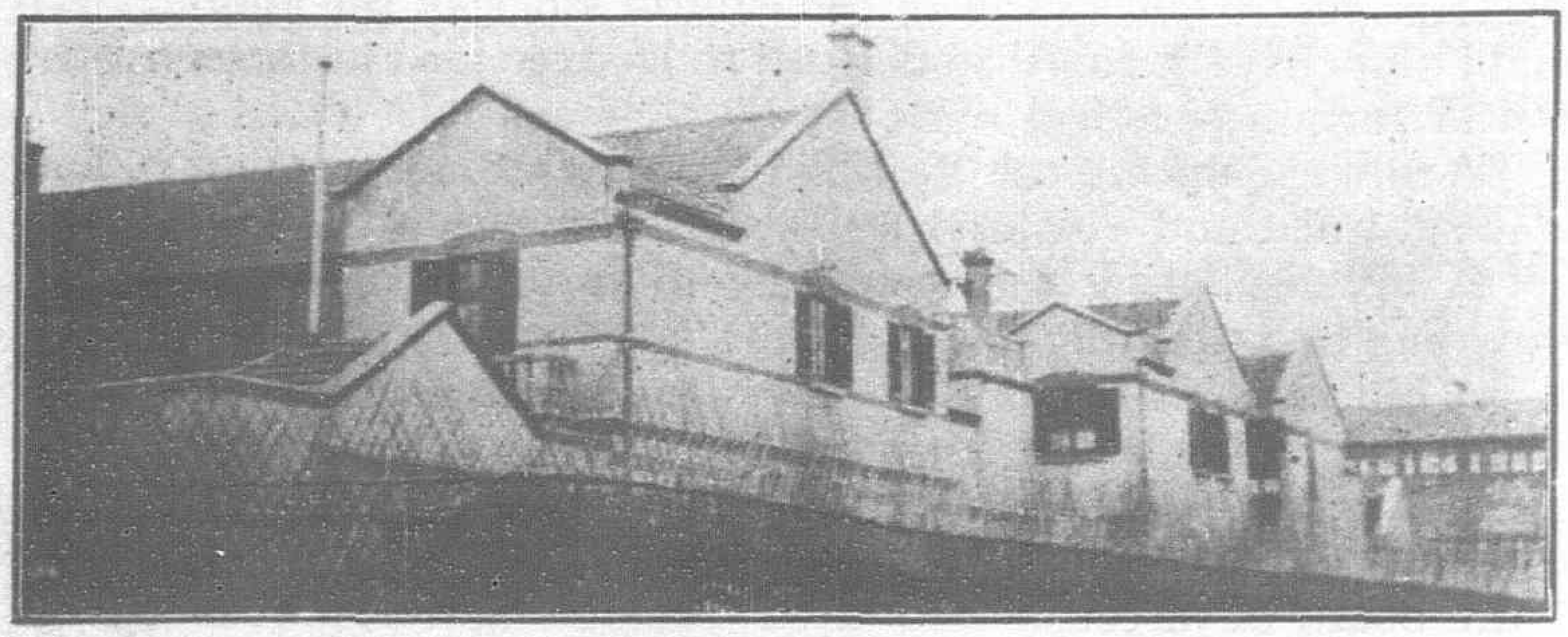
In recent years the public has come to realize the advantage of hot baths, and as gas water heaters supply an abundance of hot water instantly, these heaters are now greatly in demand. Already there are almost 1,000 homes equipped with gas water heaters and new installations are made daily. The gas water heaters range from the small instantaneous shower bath heaters to the large automatics capable of producing sufficient hot water for four or five hot baths at one time.

The growth of the Manila Gas Corporation has been practically spontaneous, mainly because of the superior advantages of gas as a cheap and efficient fuel for all purposes. It is understood that the company is planning an extensive educational publicity campaign dealing with the influence of gas in relation to health and sanitation, which will undoubtedly further popularize the use of gas.

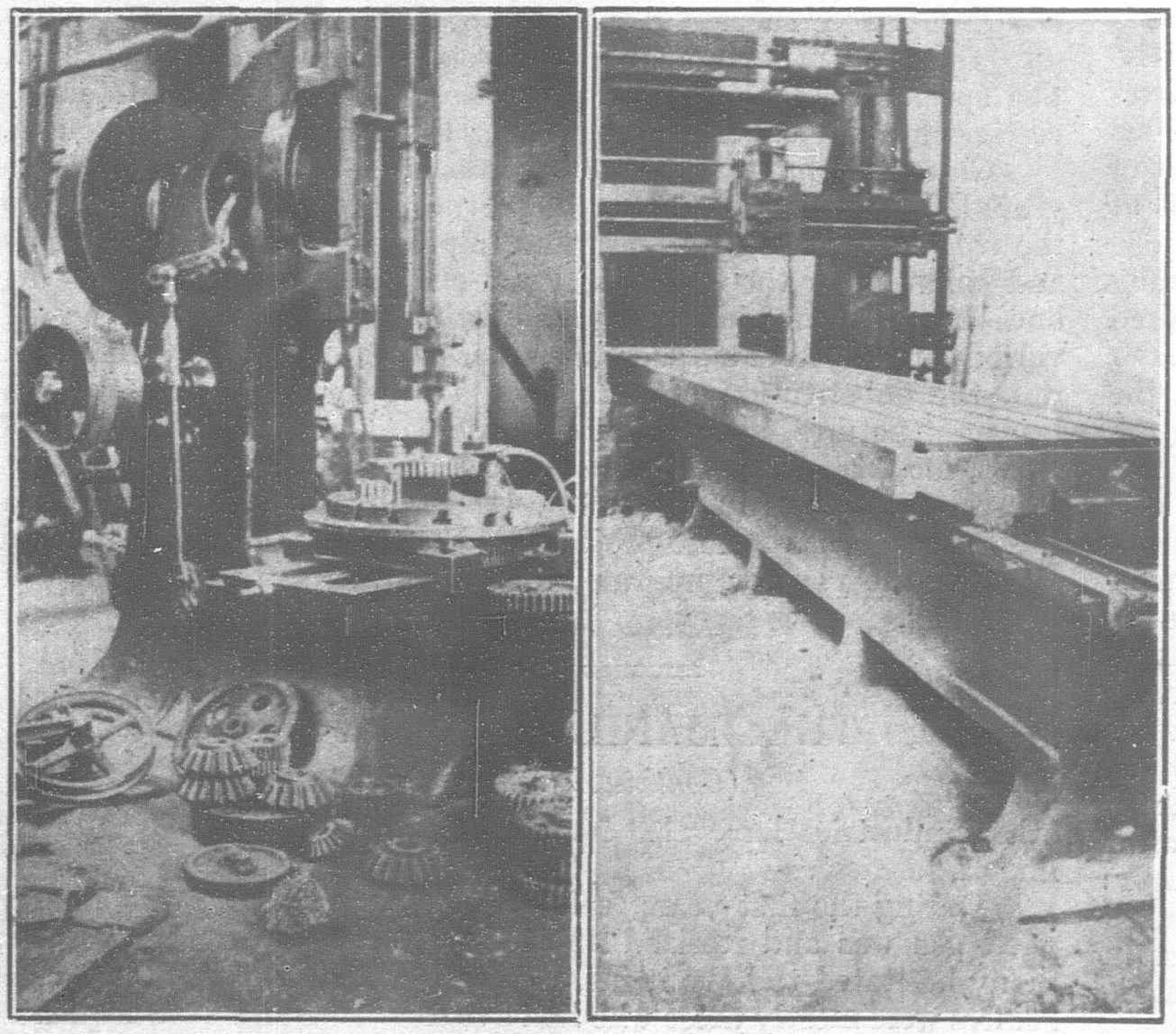
Chinese Engineering Works in Shanghai

By M. H. Chou

TO the great surprise of foreign visitors, most of the successful engineering works in Shanghai are managed not by the engineering graduates from the local technical schools in China nor by the graduates from American or European universities, but by those who are blacksmiths by profession, having very rude knowledge of Chinese and arithmetic. They learn their trade from experience and can talk a little English through having been employed by foreigners. They always start with one small crowded shop where all their family and apprentices live together and gradually expand into respectable engineering establishments covering a few acres of land. Because of extremely low overhead expense, they can easily compete with the modern engineering works run by foreigners or returned students, although the workmanship of their product may not be high-grade. A fair example of these shops is the Yah Tai Engineering Works situated on JH 12 Kwenming Road, Shanghai, started by Mr. Tsai Fong Yuen, a native of Ningpo, about thirty years ago.



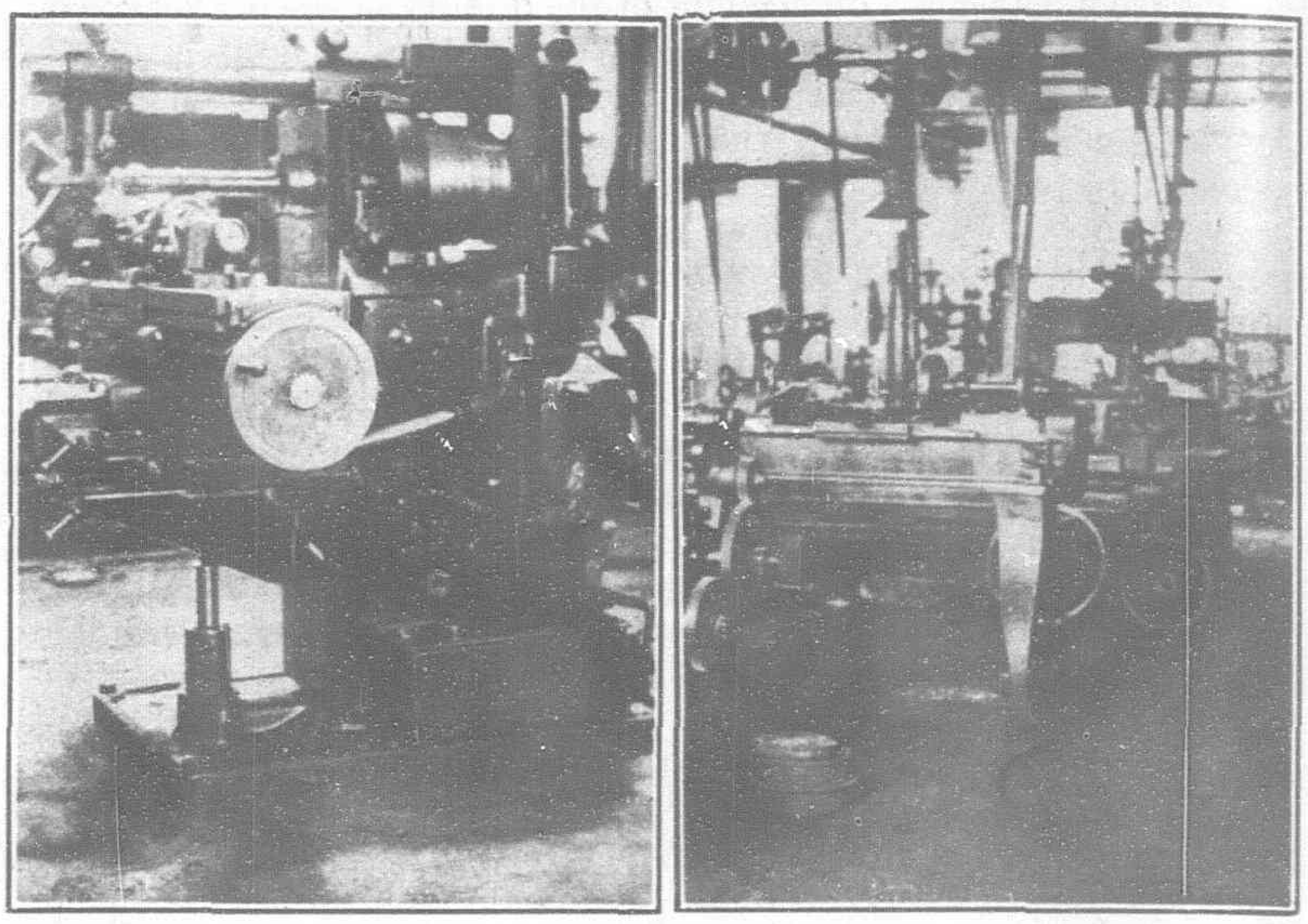
Yah Tai Engineering Works: A Typical Chinese Machine Shop of the Better Class



Yah Tai Engineering Works:

Punching Machine **20-ft. Planing Machine**

Their works consists of four departments: *Foundry, Machine, Repair and Contracting.* The foundry department manufactures boilers, steel structures, water pipes, cylinders, valves, bed-plates, layers, brackets. The machine department makes various types and kinds of machines such as humidators, crude oil engines, motors, pulleys, reeling machines, cranes, shovels, cars, elevators, road rollers, fire engine, pumps, water towers, etc. The repair department sends out skilled labor to repair the machines of different cotton mills, power stations, etc. The last department contract labors for erecting turbines, boilers, flour machinery, oil machine, etc.



Yah Tai Engineering Works:

Milling Machine **Foundry Machine**

In this they have done very satisfactory work with the following works:—Ewo Cotton Mill, Yangtszepoo Cotton Mill, Kung Yih Cotton Mill, Anglo-Chinese Cotton Manufacturing Co., Caoching Cotton Mill, Tientsin, Soochow Electric Co., Wah Foong Cotton Mill, Dah Seng Cotton Mill, Nantung Chow.

The proprietor of this engineering works is assisted by his eldest son, Tsai Chin-ze, who is taking an English and engineering course from the International Correspondence School.

From him, we learn the following interesting information about the Chinese labor system. If any boy of ten or less years of age wants to take up blacksmithing as his profession, he has to perform the ceremony of adopting his master by holding an incense before him and kneeling down before him and ponding his head three times. By this ceremony he is initiated into their labor fraternity. He is given free board and lodging and 50 cents Mex. a month for miscellaneous expenses such as hair cutting, buying shoes, socks, etc. He has to work for his master for 3-5 years without pay. The training is very severe. Any boy of delicate health can hardly survive. After the period of his apprenticeship is over, he may work for his master or some other men for ten to fifteen dollars a month. All those working under the same master consider themselves as brothers. Their fraternal tie is exceedingly strong. They help one another in employment and in other ways.

They have no social club for recreation, but spend their time in tea-shops which are considered as social centres where they communicate to one another news about the work, and all gossips of the time. They also settle their claims or differences there. If two parties do not agree, they fight.

They have one central guild which is very loosely organized. Its chief function is to have some Buddhist monks sing their incantations to drive out the evil spirit once a year and to furnish coffins at very little cost to deceased members.

The Coal Resources of Asiatic Russia

By *P. P. Goodkoff*

From "The Geographical Review"

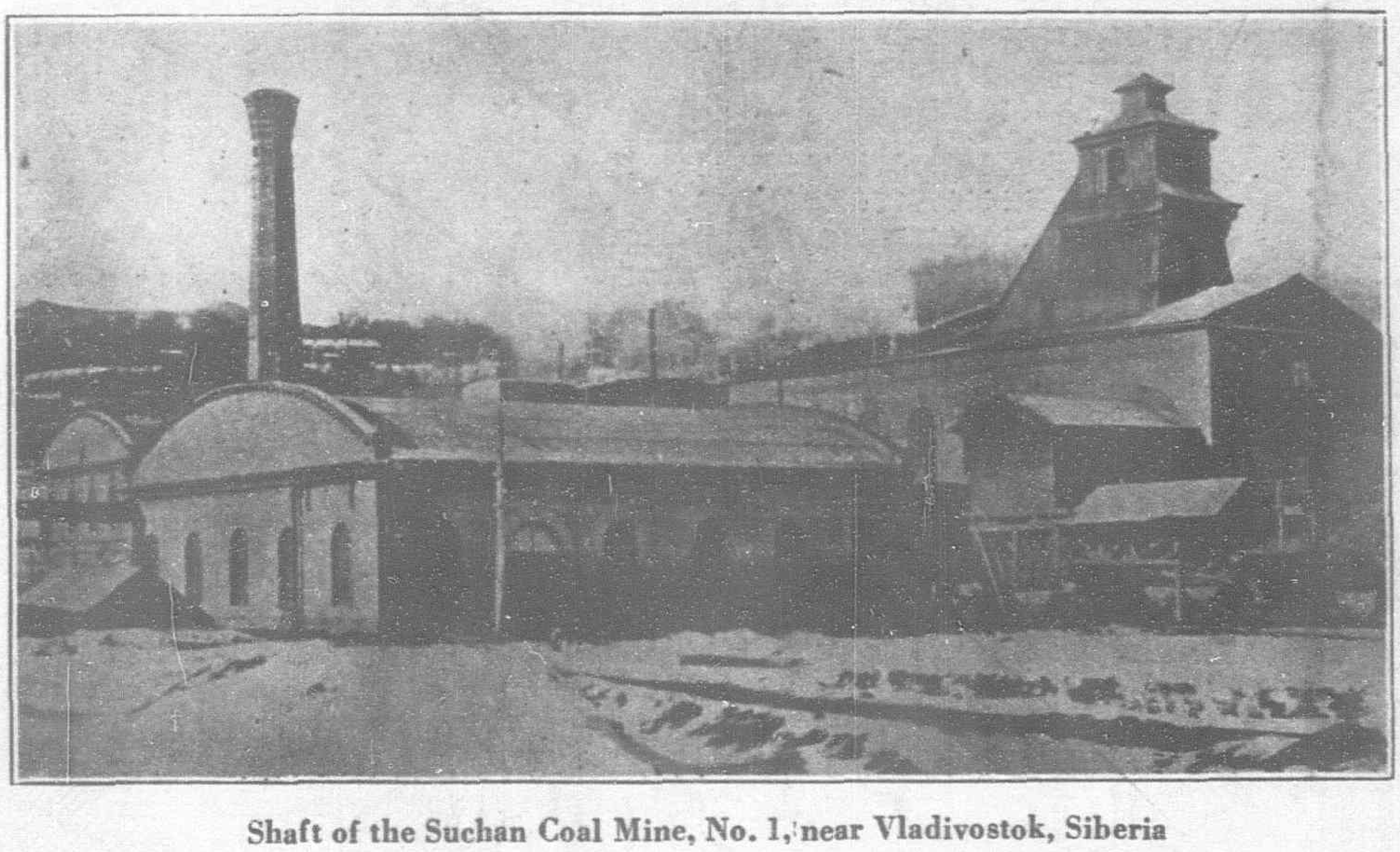
IN view of the immensely important part which the coal deposits will play in the economic regeneration of Russia which is bound to come and which we may assume will follow, in a general way at least, the channels already marked out at the outbreak of the revolution, it seems worth while to discuss briefly each of the individual coal basins and to indicate something of their economic and geographic relationships. We may divide these basins into two main groups. In the first are those which are best known and situated most advantageously in respect to present centres of population and lines of communication. In the second category are the deposits which have been less thoroughly explored, are less favorably situated geographically, and whose probable future importance we may only estimate in a very general way. To the first group belong the basins of Kuznetsk, Irkutsk, Minusinsk, the Kirgiz Steppes, Sakhalin Island, and the maritime province, as well as the less rich deposits of Turkestan and the brown coals of the Yenisei government. In the second group fall the coal fields of the Amur and Transbaikalian provinces and of the Tungusk basin and the deposits of the Yakutsk and Kamchatka provinces.

On the accompanying map, the larger basins and fields are shown in black*; separate deposits of lesser area and known crops are indicated by crosses.

Coal Basins and Fields of Primary Importance at the Present Time

1. THE KUZNETSK BASIN AND GORLOVO FIELD

The coal reserves of this basin, which covers over 8,600 square miles, are said to represent more than 50 per cent. of the total reserves of Russia. Only within the last decade has their full significance been appreciated. The coals are of all kinds and of high quality. Mining was first developed in the northern part of the area in 1898, when the western section of the Trans-Siberian railway was opened. The demand for fuel by the railway led to a rapidly mounting output from the mines, which in the years between 1910 and 1917 increased over tenfold, or from 88,710 to 1,237,800 metric tons annually. It is estimated that in the near future the annual output, in so far as it depends on the reserves of coal prepared for mining, may well reach ten million tons. This would not only satisfy the demand for fuel in western Siberia expected to prevail in 1930 as a result of the increase of population, the construction of many miles of railways now contemplated, the transition on the river steamboats of the Tom, Ob, and Irtysh from wood to coal burning, and the development of the local metallurgical industries, but it would also make possible the realization of a project for the construction of three large iron works in the Ural to be operated with Kuznetsk coke. In this connection, the total quantity of fuel which will have to be transported to western Siberia and the Ural region will probably amount to as much as 13 million tons, about 75 per cent. of which must be furnished by the Kuznetsk basin.



Shaft of the Suchan Coal Mine, No. 1, near Vladivostok, Siberia

Between 1913 and 1917 geological explorations and prospecting were conducted throughout the basin by the Kuznetsk Coal Mining Company. The construction of a railway, which is to run through the basin from north to south, was completed in 1919 to a point about 52 miles northwest of the town of Kuznetsk.

West of the Kuznetsk basin lies the so-called Gorlovo anthracite field, occupying an area some 43 miles long by 6 miles wide. The reserves of the northern part alone are calculated at 3.8 million tons, but, owing to unfavorable geological conditions, this field is as yet undeveloped.

2. THE IRKUTSK BASIN

This basin occupies an area of 17,200 square miles, or nearly twice that of the Kuznetsk fields. Over 32 million tons have already been prepared for mining by means of excavators. For the most part the deposits consist of bituminous coking coals; but at some places a transition into brown coal is known to occur, and resinous coals are found in other localities.

Here it was that coal mining on a large scale was first conducted in Siberia. The Irkutsk basin has supplied fuel for the Transbaikalian and Amur railways, and coal has been shipped from it westward as far as Taiga (southeast of Tomsk) and occasionally even to the Ural mountains. The output has ranged as high as fifty per cent. of that of all the Siberian coal mines (1,237,800 tons in 1917). Future development is guaranteed by geological conditions exceptionally favorable to mining, by an advantageous position along the railway for a distance of over 300 miles, and by the absence of sufficiently developed mines in the Transbaikalian and Amur provinces. If the production of coke is found possible, the future of the region will be even brighter. Furthermore, in connection with the projected enlargement of the Ural metallurgical industry referred to above, it has been estimated that by 1930 no less than 2.42 million tons of Irkutsk coal may be transported annually in a westward direction.

3. THE MINUSINSK BASIN

The coal-bearing formations near Minusinsk cover an area of 215 square miles and include both bituminous coking coals and subbituminous coal, of a quality on the whole somewhat inferior to that of the Kuznetsk coals though superior to that of the Irkutsk fields. The total output before the revolution was very limited in comparison with the output of the Kuznetsk basin, being 21,000 tons in 1914 and 40,000 in 1917. Future development depends upon the improvement of means of communication. The Achinsk-Minusinsk railway, which will connect the coal fields with the Trans-Siberian line, is as yet

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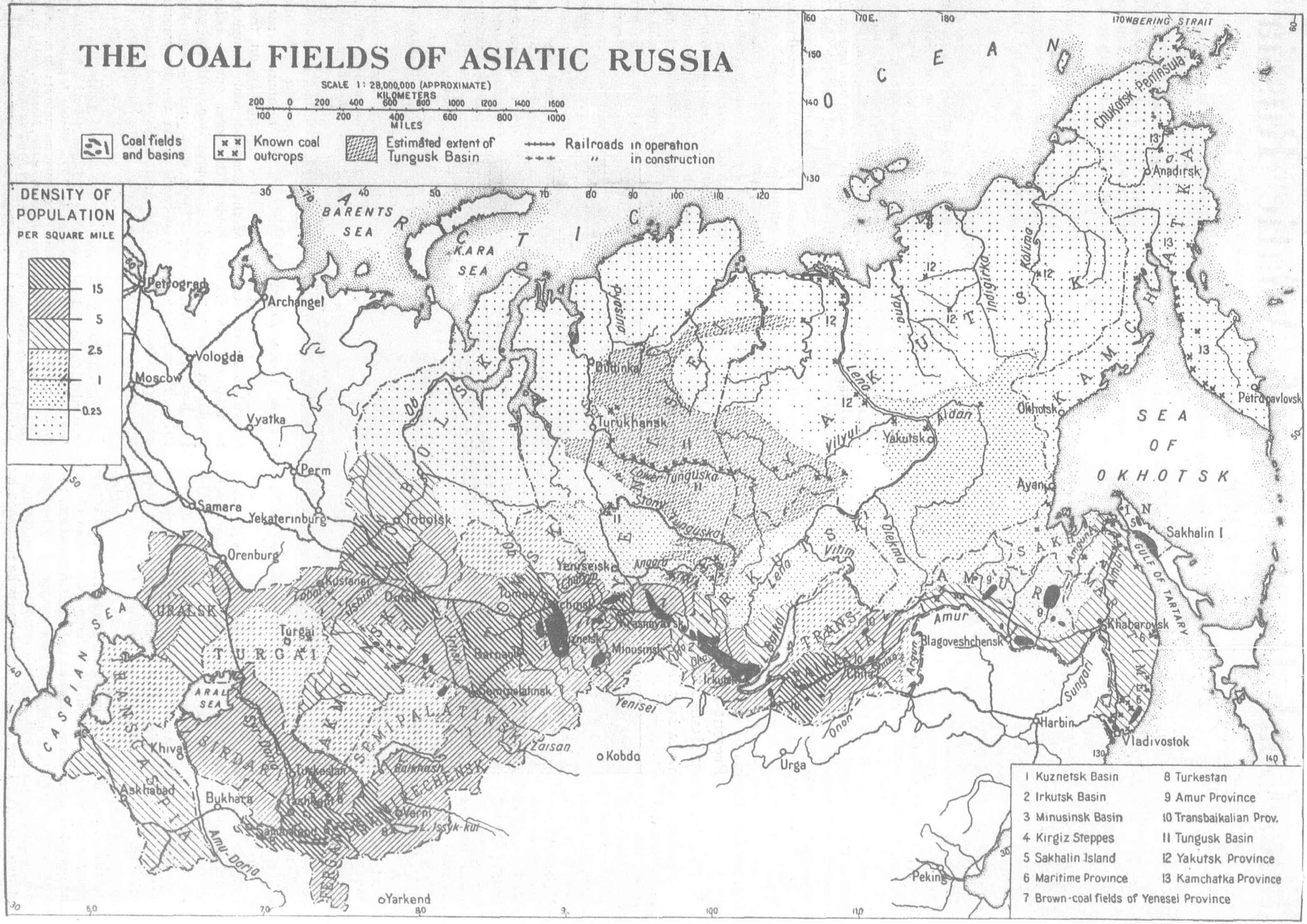
*The coal deposits as shown on this map are based upon: (1) a map annexed to "The Natural Resources of Russia," Vol. 4, No. 10, "Gold" (see above, footnote 2); (2) a map in "The Mining Industry and Mineral Resources of the Russian Far East" (see above, footnote 4); (3) S. V. Obruchev: The Tungusk Basin, *Ore Bulletin (Rudni Vestnik)*, Moscow, 1918, No. 4. The density of population is adapted from "Atlas of Asiatic Russia" (Atlas Aziatskoi Rossii), edited by the Department of Immigration, Ministry of Territorial Organization and Agriculture, St. Petersburg, 1914, map No. 26



THE COAL FIELDS OF ASIATIC RUSSIA

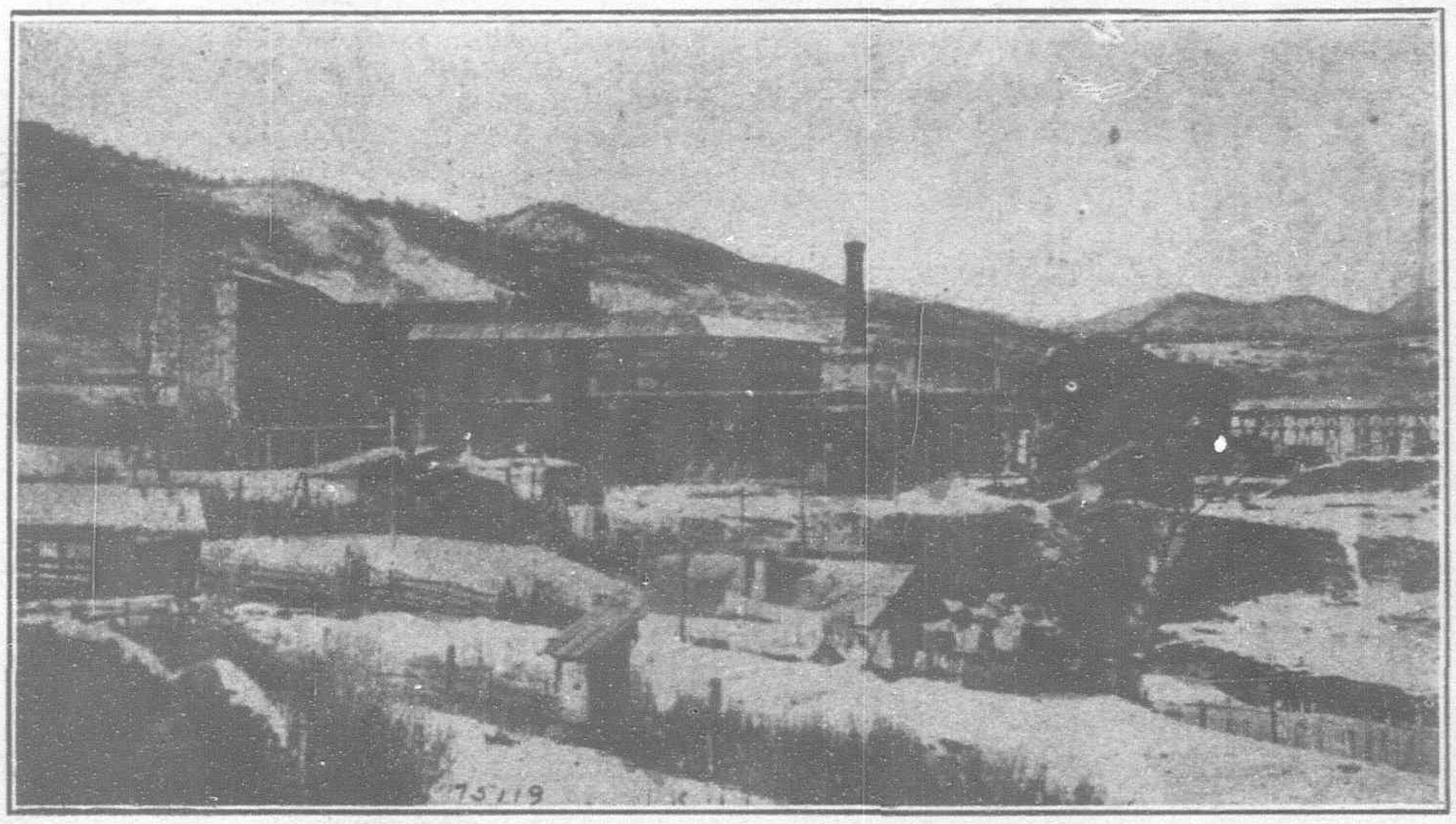
unfinished, for, although the roadbed, stations, and many of the bridges have been constructed, rails have been laid only to a point some 30 miles south of Achinsk. The line Minusinsk-Kuznetsk-Barnaul, which will also link up the basin with the Trans-Siberian and South Siberian roads, is yet as merely a project. Much may be expected from the completion of these routes, as well as from the increase of steam navigation on the Yenisei and from the exploitation of the rich iron and copper ore deposits of the southern part of the Minusinsk district. Broadly speaking, it is expected that 350,000 tons of Minusinsk coal will be sent annually to western Siberia for use as fuel.

4. The Kirgiz Steppes

The deposits of the Kirgiz Steppes consist of anthracites, coking coals, dry coals, and brown coals—all of relatively inferior quality. The total output mounted from 27,666 tons in 1914 to 98,050 in 1917. Slow advance in the industry has been largely the result of inadequate means of communication. The portion of the South Siberian railway west of Semipalatinsk was not begun until 1917. Though the deposits are neither large nor of high quality, they are of great local value on account of the absence of any other fuel in the region. Lack of adequate communications has also been a serious handicap to the exploitation of the numerous copper, silver-lead, and zinc deposits of the Steppes, as well as to the progress of steam navigation on the Irtysh.

5. Sakhalin Island

The Sakhalin fields are the best of all deposits immediately adjacent to the Pacific. They include an abundance of high-quality bituminous and coking coals and more or less lignite. Development has been seriously retarded by the absence of good harbors for the protection of loading vessels from the stormy waters of the Gulf of Tartary.



Suchan Coal Mine, No. 2, near Vladivostok, Siberia

6. The Maritime Province

Coal-bearing Jurassic rocks and lignite-bearing Tertiary deposits are widely distributed in the southern part of this province north and south of Vladivostok and for a long distance along the coast. The Jurassic coals are mainly anthracites and semi-anthracites, but coking coals and some other kinds also exist. Most of the coal is of rather low quality, though the lignites furnish a good fuel and in some deposits are very rich in volatile matter. The total production (including lignite) in 1917 was 584,800 tons. Inasmuch as a very considerable part of the coal-producing area is still unexplored, the real reserves may be greater than the estimated figures. A large increase in mining in this region is to be expected coincidently with the growth of sea and river fleet, the construction of railways, and the probable future development of the metallurgical industries on a more extensive scale.

The brown coals of the maritime province are rich in volatile matter: it is thought likely that they will be utilized for obtaining distillation products such as paraffin, benzine, creosote, etc.

7. The Brown Coal Fields of Yenisei Government

Several basins of rather large size constitute these fields. Some of the seams are rich in volatile matter which renders possible their use in the production of paraffin and other similar substances. Good domestic fuel can also be obtained from them. In the years 1917-1918 only a few small mines were in operation in this district.

8. Turkestan

The fields of Turkestan contain anthracite, coking, and non-coking coals, but of these only the coking and non-coking coals are of practical importance. On account of their low calorific power and the unfavorable conditions of stratification in which they occur-the latter have come into use only after the almost complete ex, haustion of wood for fuel.

Coal Basins and Fields of Secondary Importance at the Present Time

9. The Amur Province

Four fields of bituminous coal and one rather large basin of brown coal (about 215 square miles) are known in the Amur province. Shortage of fuel needed for the Amur railway and the impending change from the use of wood to that of coal on the large fleet of steamers on the Amur River will in all probability stimulate their development. A contributary incentive may well be provided by the exploitation of the very promising iron-ore deposits in the vicinity of the Little Khingan range. Means of communication, however, must first be improved.

10. Transbaikalian Province

The coals of the Transbaikalian province are found in separate and very small basins which contain beds of brown coal. Mining has been carried on only in two fields and there on a small scale. The most promising fields are those which lie near the town of Chita, where mining by excavators is possible, and the Bukachachi field, which, alone in the entire region, produces coal of high calorific power. On the whole it is to be expected that the coal industry of Transbaikalia will remain of limited and exclusively local importance.

11. The Tungusk Basin

According to S. V. Obruchev, the numerous coal deposits that have long been known in the region between the Yenisei and the Lena must be considered as belonging to one immense continuous basin occupying an area of as much as 387,000 square miles. The boundaries of this basin, as shown on the accompanying map, are drawn from Obruchev's data. The coals are both anthracite and bituminous, the latter in some localities grading into lignite. Near numerous trap intrusions the coals have been transformed into graphites which form at some places deposits of very considerable extent and of high quality. Information at hand regarding this great basin is very scanty; in fact it is impossible at the present time even to estimate the reserves of the greater part.

12. Yakutsk Province

Coal beds are known to exist at numerous points along the Lena north of Bestia station (60 miles below Yakutsk) and at various places in the valleys of the Vilyui, Olekma, Aldan, Indigirka, and Kolima River systems. The beds of the Vilyui valley are perhaps a continuation of those of the Tungusk basin. The deposits of first potential value are probably those on the right bank of the Lena sixty miles above the mouth of the Vilyui near Jigansk.

13. Kamchatka Province

Although coal is found at many places in the extreme northeast of Siberia and formations in which it occurs are widely distributed throughout vast tracts, the deposits of this remote quarter still remain almost totally unexplored. It is quite impossible to estimate their reserves even approximately, though it seems likely that bituminous coal and lignite are present in no inconsiderable quantities. The economic importance of these fields will depend on the use that may be made of them as a supply of fuel for the merchant marine and on the exploitation of gold placers known to exist along the coast of the Okhotsk Sea and in the Chukotsk peninsula.

Total Resources of the Siberian Fields

Table I is a summary of the total coal resources of the various fields just discussed and of the total reserves of Siberia. "Actual reserves" are calculated on the basis of positive knowledge regarding the actual thickness and extent of the beds; in the case of "probable reserves" only an approximate estimate can be arrived at; and "possible reserves" are those where no estimate in figures can be given. No account of the category "possible reserves" was taken in adding up the grand total. The figure, consequently, is conservative.

According to "The Coal Resources of the World" referred to above, the total coal reserves of the globe were estimated as follows, in million tons:

Oceania.. ..	170,410	North America ..	5,073,431
Asia	1,279,586	South America ..	32,097
Africa	57,839	Europe	784,190

Of these total reserves of 7,397,553 million tons those of Siberia were given as 173,879 million tons, which is considerably less than half the figure which can now be given. The resources of Asiatic Russia (over 400,000 million tons) consequently represent a quarter of the total reserves of Asia and are one and a half times greater than those of Oceania, South America, and Africa put together. Nor is it at all unlikely that future explorations in the Tungusk basin, maritime province and the far northeast may bring to light resources whose amount is unsuspected at the present day.

Future Development

The revolution called a halt to the industrial operations which created a demand for these coals. Siberia and Russia during the last five years have together gone through a period of economic setback. Recovery will come through the return to political and social tranquillity and through the re-establishment and increase of exports. In northern Asia Russia will find her most abundant treasure of raw materials for export. As compared with European Russia these resources are almost virgin. But they are also to a very large extent ready for exploitation, and many are very favorably situated in relation to lines of communication by rail, river, or ocean. Hitherto Russia has neglected her Siberian resources perforce, by reason of the scarcity of population in Siberia and the lack of labor which this scarcity entails. Refugees from the war and famine zones, however, have tended materially to make good this lack; and there is no reason why, when conditions are ripe for the resumption of industrial activity, there should not be available an ample personnel to carry forward this activity on an even broader scale than was the promise of 1917.

The most extensive industrial growth may be looked for in the southern and western portions of Asiatic Russia. As one advances eastward there is a progressive diminution in the magnitude of probable developments until, in the far east, one reaches a region where all projects for a long time to come will be confined to the Pacific coast and to the neighborhood of the larger rivers. The distribution of population in the case of Asiatic Russia is a fair index of economic potentialities, and the accompanying map shows how markedly the density of settlement (1911) falls off to the north and east.

The geographical distribution of the coal resources likewise coincides with the regions of porbable maximum industrial progress and increase of population. The construction of the Trans-Siberian railway resulted in the acquisition of knowledge of the coal deposits along its route and in their exploitation at a relatively early period. But the presence of the railway accounts only in part for the fact that the known coal deposits shown on our map appear to be predominant in southern Siberia close to the line. Though coals are found widely throughout Asiatic Russia, it is also likely that future exploration will serve to confirm us in our present belief that the southern and central belts are the areas where most coal will be obtained. But even were this not so, the largest basins known at the present time, those of Kuznetsk and Irkutsk, are so favorably situated that even without any assistance from other fields the former can satisfy for a long period every possible demand for coal from southwestern Siberia and the latter can do the same in respect to southeastern Siberia. The Sakhalin basin, almost unique among the coal fields of the Pacific coasts by reason of the high quality of its output, seems especially designed by nature for the export trade, and it is probable that the southern Ussuri region (maritime province) may participate in this export. The successful maintenance of commercial connections with northern Siberia through the Kara Sea seems assured by the discovery of good coal near the source of the Pyasina River and by the probability of equally valuable coal deposits throughout the immense areas of the Tungusk basin which are as yet virtually unexplored. Finally, adding to these circumstances the fact that numerous deposits are known to exist within the province of Yakutsk, we may conclude that industrial development in so far as it depends on coal supplies is possible in any part of Siberia and that, however rapidly the demand for coal in Siberia and even in European Russia may grow, Asiatic Russia will long be in a position to meet this demand.

TABLE 1—COAL RESOURCES OF ASIATIC RUSSIA—(*In metric tons*)

	ACTUAL	PROBABLE	TOTAL
1. Kuznetsk basin and Gorlovo field	1,125,000,000*b*(*a*)	248,875,000,000*b*(*a*)	250,000,000,000*b*(*a*)
		3,800,000*a*	3,800,000*a*
			250,003,800,000*b*(*a*)
2. Irkutsk basin...	1,040,000,000*b*	148,960,000,000*b*(*l*)	150,000,000,000*b*(*l*)
3. Minusinsk basin	72,500,000*b*	800,000,000*b*	872,500,000*b*
4. Kirgiz Steppes		1,100,000,000*b*	1,100,000,000*b*
5. Sakhalin Island	255,000,000*b*	1,745,000,000*b*	2,000,000,000*b*
		2,000,000*l*	2,000,000*l*
			2,002,000,000*b*(*l*)
6. Maritime province ...	4,800,000*a*		
	18,230,000*b*	46,970,000*a-b*	70,000,000*a-b*
	32,000,000*l*	168,000,000*l*	200,000,000*l*
			270,000,000*a-b-l*
7. Brown coal fields of Yenisei government ...		2,050,000*l*	2,050,000*l*
8. Turkestan ...		170,000,000*b*	170,000,000*b*
Total reserves in the basins of primary importance ...	3,280,730,000*b*(*al*)	400,926,970,000*b*(*al*)	404,207,700,000*b*(*al*)
	4,800,000*a*	3,800,000*a*	8,600,000*a*
	32,000,000*l*	172,050,000*l*	204,050,000*l*
	3,317,530,000	401,102,820,000	404,420,350,000*b*(*al*)
9. Amur province	1,380,000*b*	5,000,000*b*	6,380,000*b*
		625,000,000*l*	625,000,000*l*
			631,380,000*l*(*b*)
10. Transbaikalian province...	30,000,000*l*	170,000,000*l*	200,000,000*l-b*
11. Tungusk basin	32,030,000*b*(*a*)	40 500,000*b*(*a*)	72,530,000*b*(*a*)
		32,000,000*a*	32,000,000*a*
			104,530,000*b-a*
12. Yakutskprovince ...)		650,000*b*	650,000*b*
13. Kamchataka) province...)	Very considerable possible reserves of bituminous coals and considerable reserves of lignites		
Total reserves in the basins of secondary importance ...	33,410,000*b*(*a*)	46,150,000*b*(*a*)	79,056,000*b*(*a*)
	30,000,000*l*	32,000,000*a*	32,000,000*a*
		795,000,000*l*	825,000,000*l*
	63,410,000	873,150,000	936,560,000-*b-a*
Grand total in all the basins of Asiatic Russia			Over 405,000,000,000

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a, anthracite. *b*, bituminous. *l*, lignite. *b*(*a*), bituminous including a minor part of anthracite. *b*(*l*), bituminous including a minor part of lignite. *b-a*, bituminous and anthracite in unknown quantitative relations.

Progress in the Formosa Sugar Industry

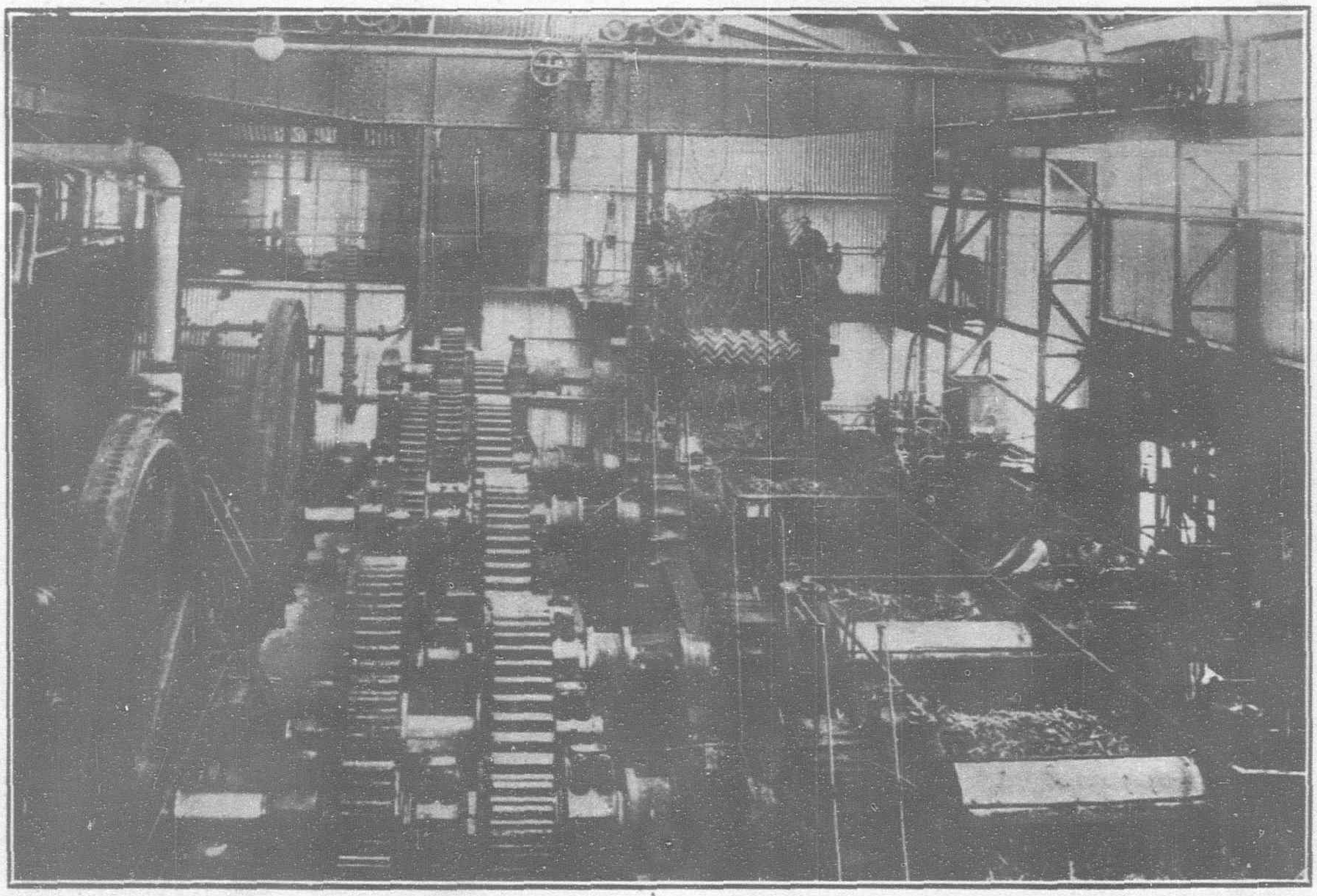
Plans to Double Production in Ten Years

THE original sugar program of the Taiwan government aimed at a production of 15,000,000 piculs of raw sugar in the districts south of the Dakesei-kei river and although the 1910 crop in this section reached 4,500,000 piculs, the typhoons of 1911 and 1912 caused such serious damage that grave fears were entertained for the future of the industry. Experiments, however, carefully carried out, showed that by substituting the rose bamboo cane with its high percentage of sugar but susceptibility to damage from wind, with a different type with great wind-resisting qualities, that the losses caused by typhoons would be obviated. Accordingly, seedlings were imported from Java, which stood the test, and to-day about 87.7 per cent. of the Taiwan fields are planted with this cane. The following table compares the percentage of the area planted to Java cane with the total area :—

Years	Total area of cultivation	Area of Java cane	Percentage
1918	101,539 *ko*	35,220 *ko*	35.1 per cent.
1919	93,374	47,839	51.2
1920	108,345	74,223	68.2
1921	129,205	105,196	81.3
1922	110,630	96,888	87.7

(*Ko* equals 2.397 acres.)

Believing that a still more perfect cane could be grown, the Taiwan government is experimenting with a native seedling developed from the Java species, under the direction of Dr. Ishida, chief of the sugar division of the central research laboratory. This cane, called the "F-19," is said to have a very high wind-resisting power, and experimental cultivation has shown that it yields more sugar per acre than the Java cane. Greater developments are confidently expected as the experiments are carried out over a longer period of time.



The maximum of extraction is obtained at the No. 1 Mill of the Japan Sugar Company, Ltd. in Formosa, by means of a "Krajewski" crusher and twelve roller mill supplied by the Honolulu Iron Works

After the severe losses incidental to the storms of 1911-12, the Taiwan sugar companies co-operated with the government for the formulation of a permanent policy to regulate the industry, but before it could be put into effect, the war came bringing with it a rapid rise in prices. The producers naturally bent all their efforts towards increased output with no regard for the increased costs of production. Extremely expensive methods of cultivation became the rule, and the question of a permanent program was lost sight of in the desire for high profits while the demand lasted. The decline in the price of sugar commencing in 1920, brought great distress to all the mill owners, especially to the cane growers, causing them to once more to turn to the government for relief. As a result of this new co-operation between the authorities and the sugar companies a program of intensive cultivation has been adopted which has already shown improved yields and bids fair to lay the foundation of a real sugar industry in the island. In the year 1920, the production per *ko* was 41,538 *kin*. This was increased to 43,517 *kin* in 1921 and to 48,531 *kin* in 1923. The total production and averages for the 1923 crop will not be known until the end of May, but it is expected to show a substantial increase over 48,000 *kin*. This improvement has been brought about by abandoning old fields where the yield has been low and concentrating on the newer lands with intensive methods of cultivation.

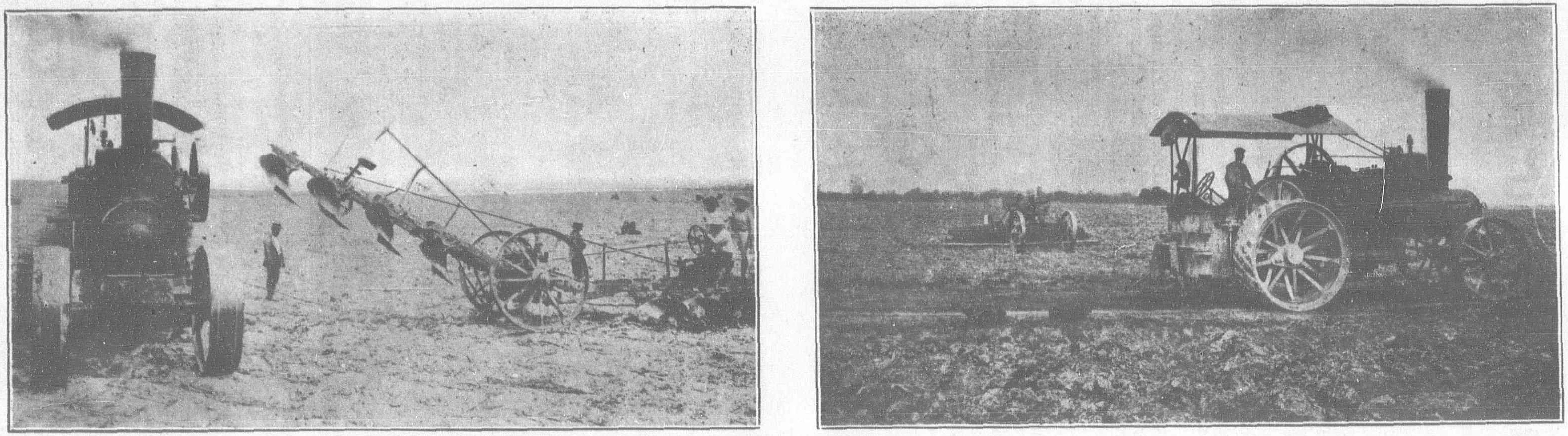
The imperfections of the tenant farmer system are held to be largely responsible for the extensive cultivation of lands, where the tenancy of the farmer has been limited to one year. The improvement of the fields by fertilizing and deep plowing at the expense of the tenant, resulted in the owner invariably exacting a higher land rent for the following season. For thirty or forty years in the new districts and for hundreds of years in the older sections this style of tenancy contract has been in vogue, resulting in a steadily diminishing return from the land. The government has now reformed these old regulations so the tenant will have possession for a minimum of six years, with all agreements in writing and registered, instead of by oral agreement as in the past. Unless notice of termination of contract is given within six months of the date of its expiration, it is to be regarded as renewed on the same terms.

As an instance of how this method is working out, the case of the Hokko Mill of the Toyo Sugar Company may be cited. This mill has a large tract of land badly drained, and in consequence, nearly wild. The land has been rented to a selected number of farmers for an unlimited period, the shortest contract being for six years. As a result of this longer tenure and prospect of reaping adequate rewards from their labor, the farmers have exerted themselves to increase production, and have boosted the yield of cane per *ko* from 26,879 *kin* in 1913 to 69,877 *kin* in 1921, an increase of almost 250 per cent. Further increases are expected for the present year when it is expected the lands will yield more than 75,000 *kin* per *ko*.

The results obtained by the Toyo Company have convinced the other operators that the simplest way to increase production is to reform their tenancy agreements, believing that if this showing can be extended to all the other sugar districts, it will be possible to increase production to a point where Taiwan can compete with other sugar-producing countries in the world markets. The

DOUBLING THE FORMOSAN CANE CROP BY INTENSIVE CULTIVATION

View of Modern Agricultural Machinery on the Lands of the Taiwan Sugar Company, Ltd.



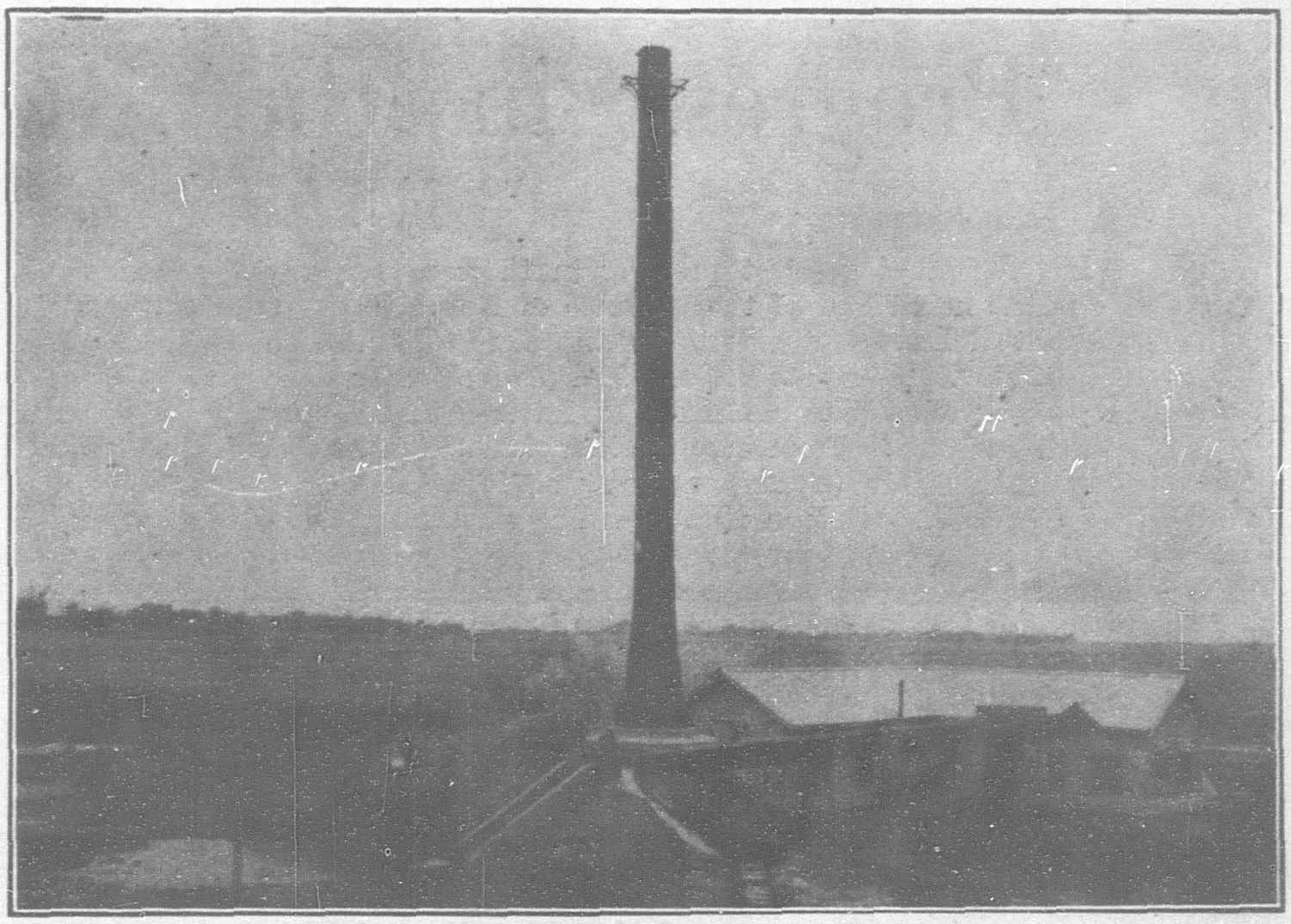
"Fowler" Steam Plows and Harrows Prepare the Land for Planting

Caterpillar Tractors Hauling Gang and Disc Plows

Rinhongen Sugar Company has already made great progress since it instituted changes in its tenancy system, and its Hokko mill is accepted as a model for others to follow. All the other leading companies, such as the Taiwan, Ensuiko, Dai Nippon, Meiji and Niigata have commenced to apply the new regulations, encouraging early planting, with the result that an excellent cane is being grown that stands the ill-effect of wind and rain storms better than any species yet planted in the island.

The sugar expert of the Taiwan government looks forward to doubling the present production during the next ten years. By judicious selection of seed cane the crop yield can be increased 20 per cent.: scientific fertilizing will increase the yiled at least 50 per cent. irrigation and draining another 20 per cent. and 10 per cent. by exterminating insect pests. Already the improvement from better seedling has been noted, but as fertilization of many fields has been neglected for so many years, it will take some time before any appreciable betterment will be noted from this item.

According to the central research laboratory, the economic limit of fertilizing is ammonium sulphate, 20 *kwan* (*Kwan* is 8.28 pounds), bean cake, 10 *kwan*, and superposphates, 30 *kan*, per *ko*.



One of the Pumping Stations for irrigating in the fields of the Taiwan Sugar Company

To provide water for irrigation, the government plans to construct a great reservoir at Kandenkei, in the Tainan district, receiving its supply from the Sobun-kei river, while another plan contemplates the irrigation of 150,000 *ko* from the Dakusei-kei river. The total cost of these two projects is estimated at Y.42,000,000, the work to be completed and water for irrigation ready in April 1926. The districts covered by these plans will include the lands and mills of the Taiwan. Meiji, Ensuiko, Toyo, and Japan Sugar Companies. When completed, it will be possible to convert the present uplands into irrigated fields, and increase production by about 20 per cent.

From almost every point of view the future of the industry in Taiwan is very bright. If the companies restrain their tendency to declare extraordinary dividends, the industry should be firmly established on a new and sounder basis within a few years.

UNZEN

(*Continued from page 421.*)

is taken from Nagasaki to Mogi, via Tagami, and from Mogi to Obama one crosses by the steamer.

Obama is situated on the west coast of the Shimabara peninsula at a distance of 15 miles across the Chijiwa Sea from Mogi. There are several saline hot springs of intermittent nature. The Ikkakuro Hotel opens throughout the year; visitors to Unzon find it advantageously situated for passing a night or obtaining meals *en route to* or from the Hill resort. There are no less than fifty inns for the accommodation of Japanese. The beach is reserved for recreative purposes. Obama has a good water supply, waterworks having been constructed there in 1907.

The climate in winter is warm and attracts many visitors. Within a short distance of the town is a white sandy beach, with pine groves extending several hundred yards. This beach is excellent for sea bathing.

About one mile and a half from Obama on the road to Unzen is Bingushi, and another mile and a half higher up is Kagotateba, which in olden days was a station at which the bearers of *kago* (palanquins) of nobles stopped to rest, hence the name.

This point is about half-way to Unzen and commands a splendid view of Ariake Bay, over the Aino isthmus, the lovely hamlets of Obama, Chijiwa, Aino, Moriyama and Uki, and the Chijiwa Sea at the foot of the mountain.

Ascending again about two miles from Kagotateba, Fudanohara is reached.

Here are found several tea-houses, and the neighborhood is extensively cultivated. About three hundred years ago it was the site of the famous Mammyoji monastery, when hundreds of temple buildings occupied the place. They were all destroyed by fire in the Shimabara rebellion, during which they were attacked by the Christians who had fortified themselves in the Hara Castle at Arima. The fragments of a large *torii* (Shinto gateway) are the only ruins now to be seen. The road divides here, the left branch leading to *shinyu* (new spring), Unzen, and the right to Kojigoku, which is half-a-mile distant. These roads are quite level. The bath-house at Kojigoku is supplied from a spring of boiling water which is worth seeing. Near Kojigoku, in the steam which has its source in the springs of Shinyu and Kojigoku, there is an attractive waterfall, called Issaikyo-no-taki.

Unzen park occupies a tract of land with stretches of hills lying between the peaks Kinugasa-yama and Yatake and covers an area of 649,000 square yards. On the east side of the park are many fumaroles which send up vapor and gasses to some height. Benches have been placed near them for the convenience of visitors. Azaleas grow in every part of the park and present a very beautiful sight in May when they are in bloom.

The construction of a large meeting-hall was completed in 1913, by the prefectural authorities, the building called The Public Social Hall; it covers 552 square yards and in bad weather is used for indoor exercise. The extension of 143 square yards of the building to provide for a reading room, and a card-playing room was completed in 1915. Its verandah, being large, is convenient for enjoying a fine view. A billiard-room adjoins the hall.

There are two lawn tennis courts, both open to the public on payment of regular fees, and attached to them is a pleasant pavilion.

There are two sections in Unzen, Shinyu (new) and Furuyu (old).

The Shinyu public bath-house is located in the park and is connected with the springs at the foot of Yadake. It is four bath tubs, which are kept clean and always overflowing.

There are six hotels, the Shinyu, Kyushu, Takaki, Yūmei, Fukiya, and Midoriya which have adequate foreign accommodation.

A post office is opened every year on March 1st and closed on October 31st. It transacts telegraphic, telephonic, money order service, etc., and distributes mails thrice daily.

Furuyu is situated 600 yards from Shinyu, and the springs are similar to those at the latter place. There are about a dozen inns.

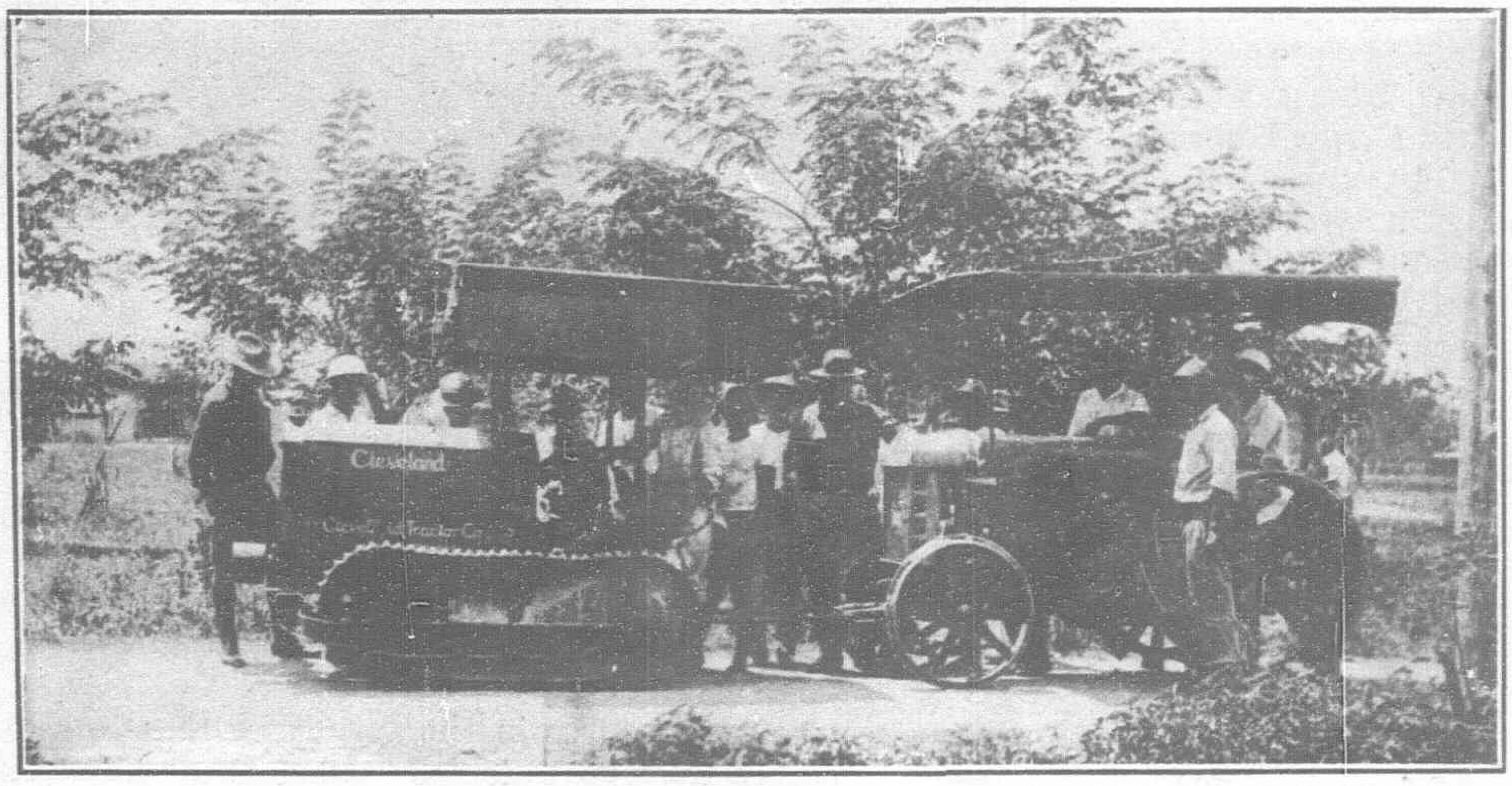
There are two paths to reach the golf course, one running from the park via Yadake above the fumalores, have been completed in 1915 for convenience of the players, and the other going through a thick wood turning off to the right from the Chijiwa-road to Furuyu. The course, which runs round a pine-clad hillock, covers 203,000 square yards and has nine holes. The links are open to public on payment of regular fees. A pavilion, equipped with toilet and dressing-room, dining-room, and bar, was built in 1913. It is one of the best in the Far East, as no pains were spared by the authorities in its construction. The site is naturally suited for the pastime and is very attractive, especially in May when the azaleas are in bloom.

Progress in the Rice Industry

By Kilmer O. Moe

THE region of greatest progress in the rice industry is the north half of the province of Nueva Ecijs in central Luzon, otherwise known as the homestead country. This province has had a wonderful record due principally to the influx of settlers to take up virgin lands. From investigation made from reports of rice buyers the palay (paddy) actually sold in 1909 was found to be 1,600,000 cavans; in 1916 it had reached the total of 5,000,000 cavans; and, at the present writing, it is approximately 7,000,000 cavans. (*Note.*—A cavan is 44 kilos of unhulled rice).

The reason for this increase in production lies in the fact that the wild lands of the northern half of the province, in which the Muñoz agricultural school is situated, are fast being converted into productive rice fields yielding every year an increased production. The jungle and cogon lands of 1909 have nearly all disappeared and in their stead are new barrios and cultivated fields. It is a significant fact that this progress has been coincident with the construction of roads which open up the country and provide an outlet for the products raised.



Learning to Operate Agricultural Machinery. Tractors are used for a Variety of Purposes in the Rice Industry.

Roads accomplish for the farmer more than he often realizes. They not only give him better transportation facilities but open up for him opportunities which he never dreamed of before. Intercourse with his fellow men affords an interchange of products, but what is of greater importance, it affords an interchange of ideas. Isolated towns which for a long time have dozed away in sleepy indifference, take a new lease on life as soon as the road is extended. The sound of the auto is heard through the streets, markets flourish, and business becomes brisk and vigorous.

The old residents shake their heads over the changed conditions but new blood soon makes itself felt and new ideas gain control. Those who are unable to adjust themselves to the changed conditions are left behind.

Any one who has seen the long strings of bull carts on the road to market stacked high with paddy will appreciate at once the economic value of good roads. These carts, because of the surfaced road, carry 20 to 25 cavans of grain, when formerly on account of inferior roads half of this was considered a good load. Every thoughtful citizen must look upon road building as one of the great factors in the industrial, commercial and educational development of the country. Let us see what progress it has brought to the humble producer in the rice industry.

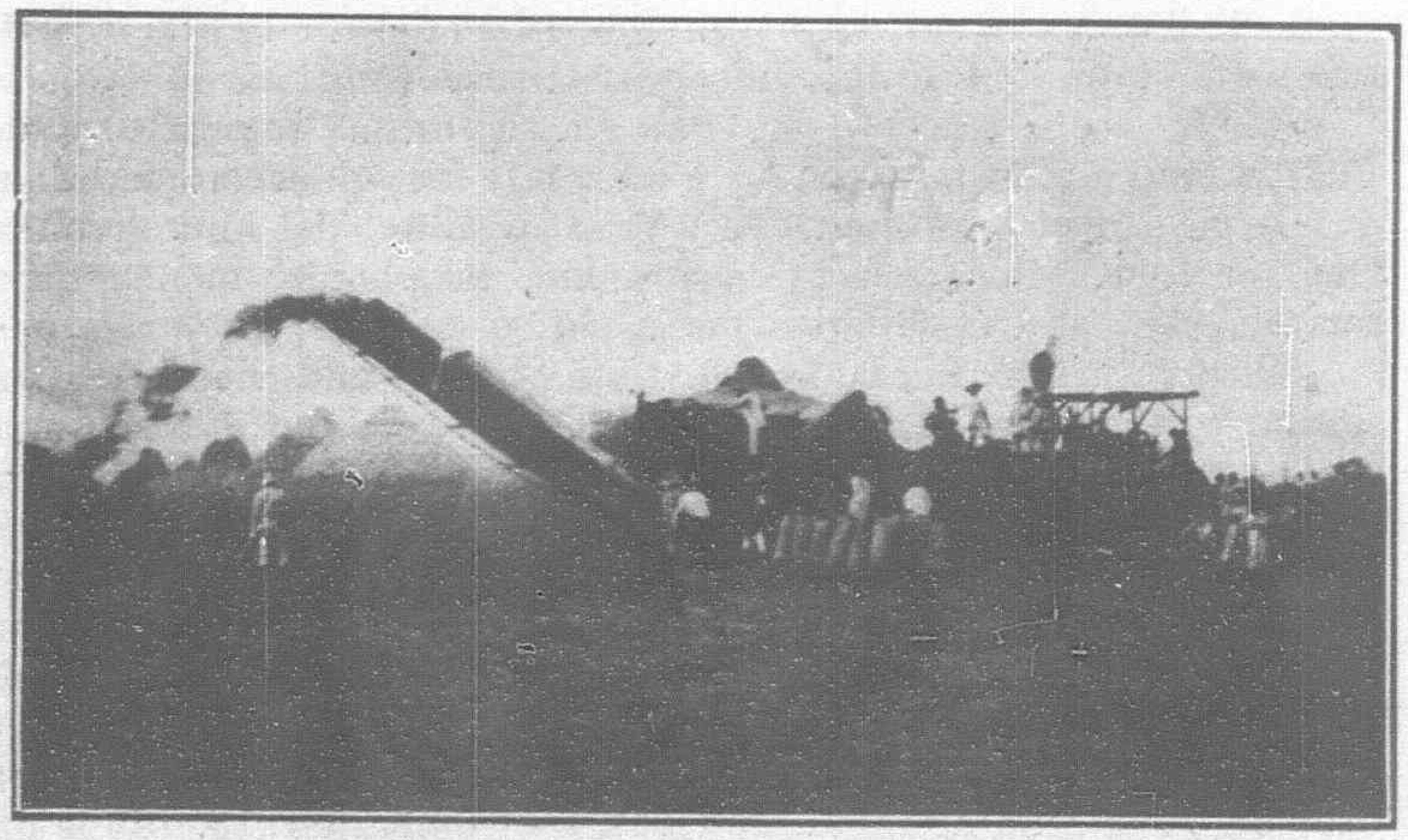
The Small Rice Mill

Until very recently anyone would know the proximity of a barrio or village in the rice provinces by the thump of the pestles which the women use in pounding rice. Even now, in all the outlying districts, any other process of removing the husk from the rice kernel is unheard of. Wooden mortars with a capacity of a ganta (*Note:* A ganta is equivalent is three liters) or two are still a part of the household equipment in rural sections of the Philippines and it is even now the daily task of the women to pound out the rice for the next day's meal.

But a gradual change is coming over the situation. As progress finds its way along the newly built roads that penetrate through to the sleepy towns and villages, the drowsy country side is roused out of its age-long sleep and begin to sit up and take notice. Even the women refuse to be bound any longer by the traditions of the past. They are fast going on a strike so far as pounding rice is concerned and are seeking other means of preparing the daily ration.

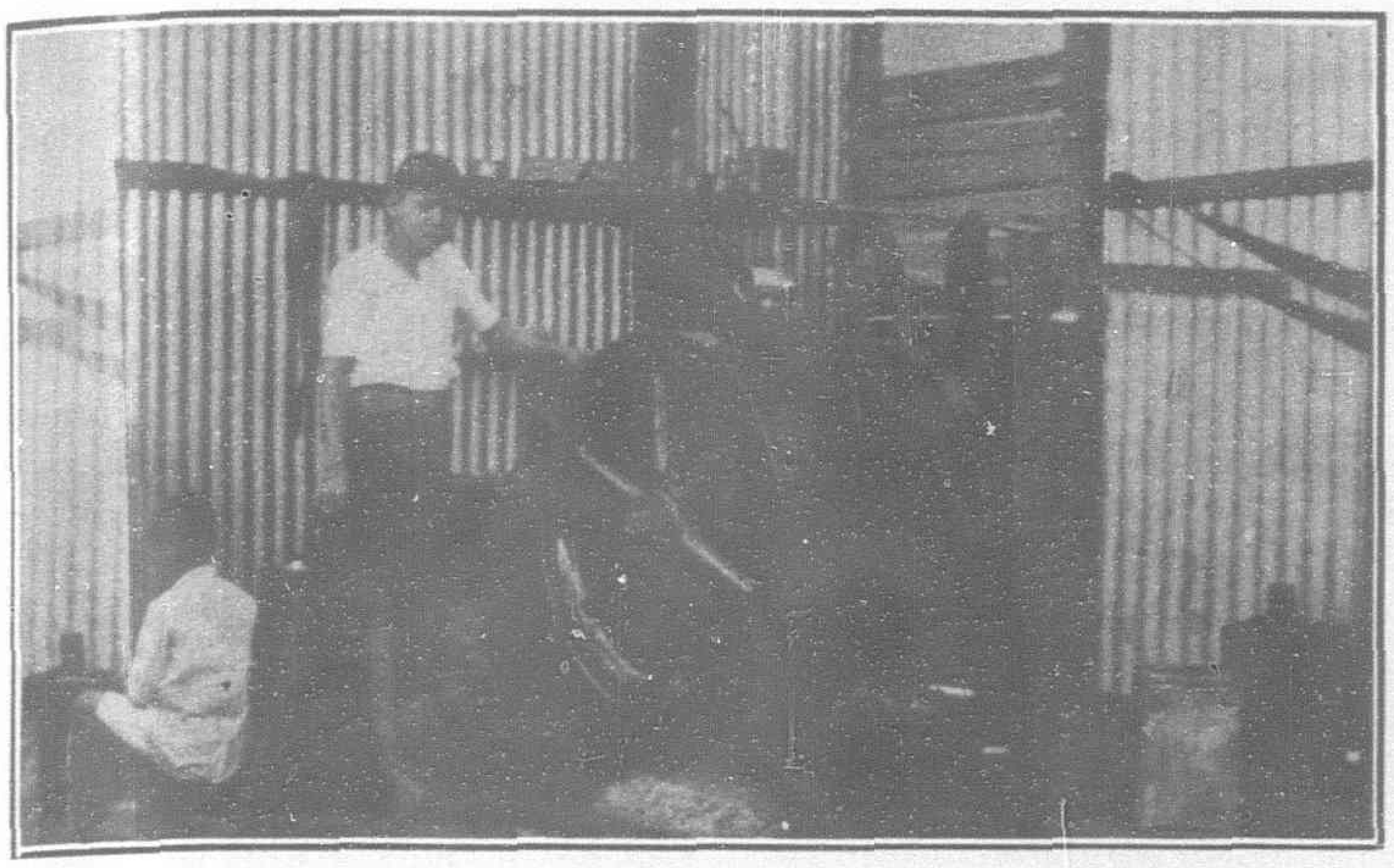
This is the opportunity of the small rice mill. These little plants are multiplying in number very rapidly. It may be said that they have already invaded the towns and most of the barrio in central Luzon and the end is not yet.

The first of these little rice mills was brought to the central Luzon agricultural school at Muñoz about ten years ago. It was a plantation huller of the type which has since found great favor in

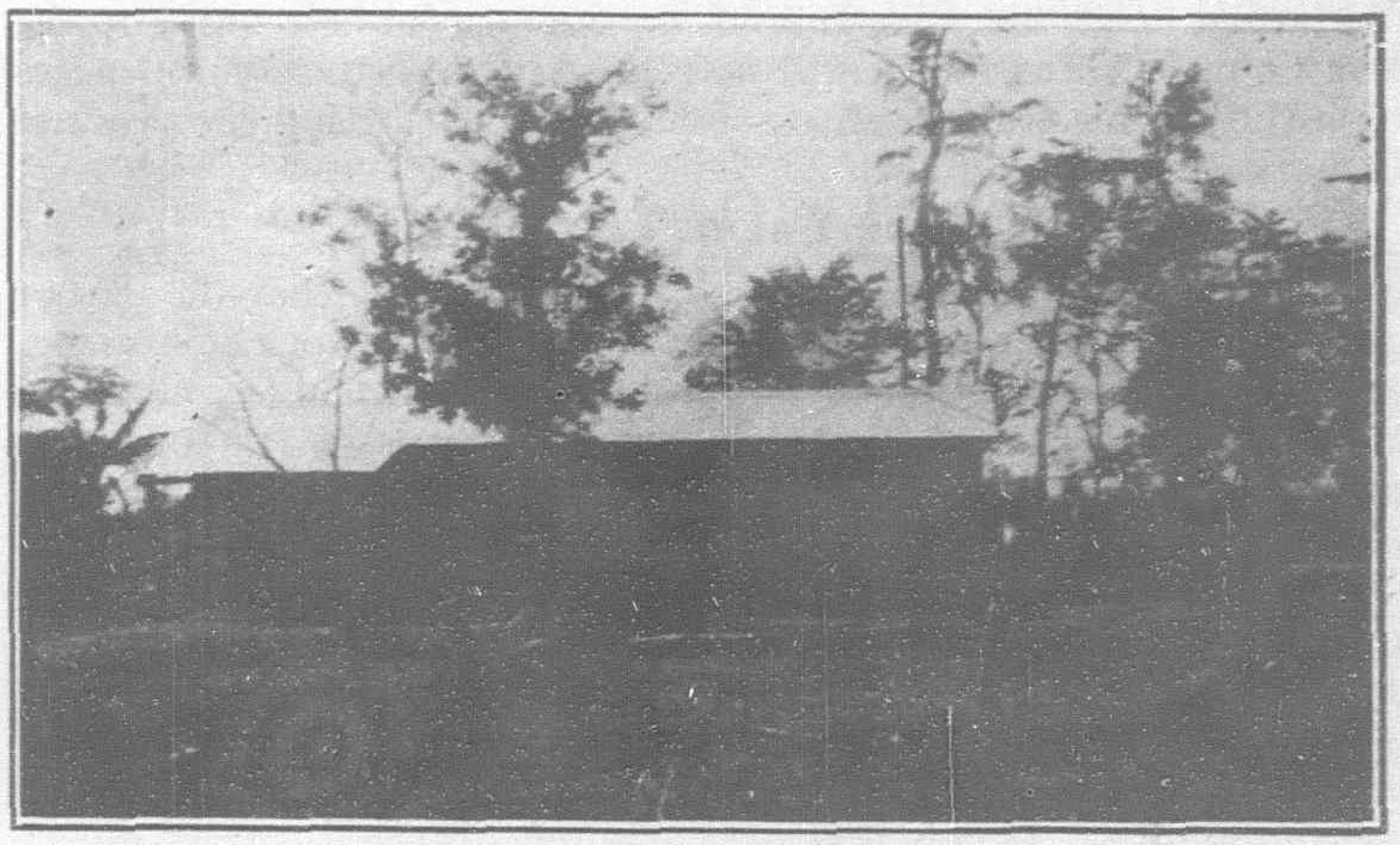


Steam Rice Thresher at Work on the Central Luzon Plain.

The Heavy Service Truck with Trailer is Supplanting the Bull Cart for Rice Transportation in the Philippines.



Type of Power Plant in Common Use in the Rice Growing Provinces for Hulling Rice



Small Rice Mill in the Rice Provinces

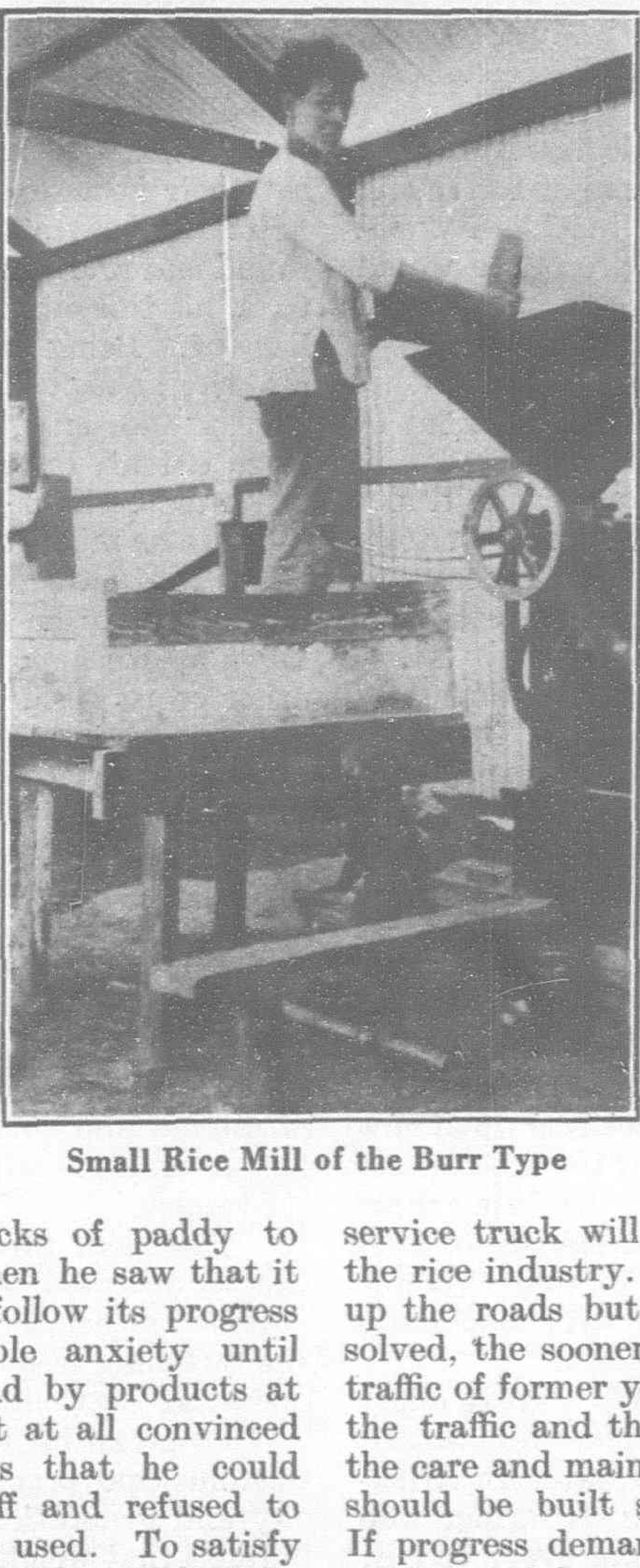
the rice provinces. For a number of years the people in the towns and barrios looked askance at this innovation and continued to pound out the rice by utilizing the unpaid labor of women and children.

But little by little the small rice mill plant came into its own. When once started the movement spread very rapidly. The last three or four years have been the greatest progress. This is undoubtedly due to increased prosperity in the rice-growing region, but also, in no small part, to the desire for better things that come with progress and enlightenment. It is found that the forty centavos collected for hulling a sack of paddy rice does not pay for the labor expended in pounding it out. The barrio people are learning that it is easier to earn the money by other means and to have the rice hulled by machinery.

Importers in Manila tell us that it is almost impossible to supply the demand for small rice mills of the kind that are being installed in the barrios. An avalanche of orders came and for a time it was difficult to get the mills in fast enough.

It doesn't do to go too fast in this game, however. The writer found that the mill installed was not able to keep up with the demands upon it so a stone mill was added with elevators, a separator and a polisher. The small farmer brought in his couple of sacks of paddy to be hulled and dumped it into the hopper. When he saw that it disappeared up the elevator he was unable to follow its progress any longer. He stood around with considerable anxiety until his sacks were accounted for in hulled rice and by products at the other end of the building. But he wasn't at all convinced that he was getting it all back in a process that he could not understand. His companions also held off and refused to patronize the mill unless the old installation was used. To satisfy this class the more economical mill had to be discarded and a battery of steel burr mills was substituted. The *taos* were satisfied because they could pour their own grain into the hopper and see the hulled rice and the by-product come out below.

The small rice mill is just the thing for hulling the grain locally. Of course, it cannot compete with the large mills at the large centres but it will do sixty to eighty sacks a day which yields the operator a neat income after he pays his expenses. The installation is usually a crude oil engine of 10 h.p. or thereabouts turning a rotary burr in close proximity to fixed steel knives or sharp edges. The paddy is ground between these surfaces until the husks are removed and the size of the kernel is so decreased that it will pass through the screens. A fan separates the chaff together with the lighter by-products from the grain and the clean rice is then caught in sacks. One of these little mills can be installed, everything complete, for Tls. 2,500 Philippine currency.



Small Rice Mill of the Burr Type

The Service Truck in the Rice Industry

From time immemorial the rice grower has depended upon the carabao and bull-cart for transporting his crop to market. It is not uncommon even now to see strings of bull-carts several kilometres long in the rice-hauling season lumbering along at a slow moving gait toward market. These strings have lessened considerably in the last couple of years in spite of the fact that the harvests have been larger than in former years. This is due entirely to the fact that the heavy service truck is taking the place of the bull-cart in transportation.

Anyong passing along the Manila north road will see piles of sacks filled with palay (paddy) stacked up along the highway waiting for some truck to stop and convey it to market. This innovation takes very well with the rice producer who lives in the proximity of the main road, as he can leave his sacks on the side of the road and have them transported to market quickly and with one-third of the labor and trouble of former years. This releases his caraboas for more important work on the farm or gives them a rest and puts them in fine shape for the approaching planting season.

There is no doubt but that the heavy service truck will, in the future, be a most important factor in the rice industry. It is true that these heavy conveyances grind up the roads but that opens up another problem which must be solved, the sooner the better. Roads that were built to carry the traffic of former years no longer serve the needs. We have trebled the traffic and this should call for an increased expenditure in the care and maintenance of our highways. Above all the roads should be built so as to meet the increasing need for service. If progress demands the use of the heavy service truck, then the roads must be so constructed that they will stand up under it. The authorities should realize tha the roads are built for the convenience of the producer rather than for that of the pleasure seeker. These will be a great demand on the part of the farmer for better roads just as soon as he realizes their value in the transportation of agricultural products.

The heavy service truck has come to stay. It will eventually supplant the carabao and cart wherever the roads are such that the truck can be used economically. Its use is tied up with the problem of extending them and in keeping them in a good state of repair.

Along with the freight truck is the passenger truck that solves the problem of easy communication between towns and binds extensive areas into one large community. Every time a new road is opened an auto line is started with the net result that it arouses new interests and awakens new desires. It is the gratification of these desires that make for progress in the community.

The farmer needs his work animals on the farm to help build up the farm home. These forces will be released for productive purposes when the service truck carries the load of transporting the produce to market.

The Farm Tractor

There was a time when prices of farm products soared. Labor and work animals became scarce and the farm tractor came along, a much heralded solution to the problem of increasing production. A campaign of advertising set in and ship loads of tractors were imported. A thousand or more tractors found their way into the hands of Filipino farmers in the period of a single year.

But a situation soon developed that was anything but satisfactory. The dealers for the most part concentrated on sales rather than on service. In this way they did the very thing that tended to kill the business in the shortest time possible. No farmer is going to buy tractors unless they prove satisfactory in his community. If it is necessary for him to pull a tractor out of the field and again resorts to the slow moving carabao, it will mean an object lesson for the entire community which will not be lost on prospective buyers. Every *bonâ-fide* tractor dealer must be ready to expend money for a large supply of spare parts and for service. A follow up system must be installed looking to the economical use of every tractor put in the field.

There was a tendency on the part of tractor dealers to scatter individual machines over wide areas. In a campaign for selling this system was adopted in the hopes that these machines would establish a market for other machines. Such a procedure would have been satisfactory provided a mechanic had been placed with each machine to keep the outfit running so that it would prove a satisfactory investment for the purchaser. This was not done except in a few cases and the scheme proved the worst kind of salesmanship.

Service is the weakest link in the tractor game. The dealer that disregards it is a menace to the industry. To make matters worse, numerous tractor companies sprang up all over America to take advantage of boom prices. Many of the machines turned out fell below the requirements. Some are no longer made. These machines represent a great deal of money and, unless something is done to prevent it, they will be dumped on countries like China and the Philippines.

Every tractor dealer should be forced to take over a live agency. He should be forced to keep an adequate number of spare parts in proportion to the number of sales made. This feature will have the tendency of increasing the price of machines, but it is far better to pay the price and get the service than to buy something that becomes useless in a short time.

But in spite of shortcomings on the part of dealers and other drawbacks too numerous to mention, the farm tractor is gaining in favor. In the rice industry it has a place in the breaking up of new land and in preparing the soil for upland rice. In the Philippines there are millions of hectares of uncultivated land. To bring these areas under the plow would help to drive away the menace of food shortage which threatens the islands from time to time. Lands that are flooded and diked are difficult to manage with machinery but new fields may be tilled without any serious trouble.

Besides being used for plowing the tractor finds a great many other uses in the rice industry. It is a good power plant for stationary work. It will pull a threshing machine, pump water for irrigation, run a little rice mill, and haul heavy loads. A farmer who knows how to manage may keep his tractor running every day in the year.

The plowing season is usually only about one hundred days. After that there is the threshing and the bulling of the grain. The demand for tractors in large numbers will develop as progress in the rice industry develops. But it is constructive work in which dealers must co-operate with farmers to get the best results.

Threshing the Grain

One of the first attempts to modernize the rice industry was the introduction of the steam thresher. In the province of Nueva Ecija more than fifty of these units are operating at the present writing. A dozen or more have been operating successfully for at least ten years.

This improvement supplants the time-honored system of threshing the grain by treading it out with animals. This is yet the common practice even after a decade of demonstration with threshers. The operation of rice threshers are seriously handicapped in the orient due to inefficient labor. Because the concaves are improperly adjusted, they break the grain, partly hull the kernels and otherwise lower the quality of the product. Farmers who observe these defects are apt to enlarge upon them and go on using the old, old practices of their fathers.

But the thing that prevents the use of threshers on a larger scale is the fact that the industry is organized on the old basis and it is difficult for the farmer to realign his forces to meet the changed conditions. He has on his hands a herd of animals. They will eat their heads off unless he finds steady employment for them. After the harvest, therefore, he gathers them in and drives them round and round on the threshing floor. If he engages a machine to do his threshing he will have to pay eight to ten per cent. of his harvest. Being naturally frugal in disposition the farmer does not see why he should not save this amount by using his own animals.

In one sense, he is right. Success in farming is based, to a large extent, on ability to use the means available to the best advantage. So long as he does not use his animals to a better purpose he might as well thresh his grain with them. But the way out is to use them for other productive purposes. The rice farmer is very apt to be satisfied with poor living conditions. He should build up his home by having a vegetable garden, an orchard and other crops besides rice. Root crops and legumes are good food crops and may just as well be grown as not. Permanent agriculture will demand a change from the one crop system and this will call for machinery to do its share of the work so that men and animals may be released for other purposes. That is the great service that machines can render for mankind.

Of late years the farms tractor has become more popular in its use with the threshing machine. This is a big improvement as the heavy steam outfit is too cumbersome to handle in a country where all cultivated areas are criss-crossed with irrigation ditches. One of the most difficult phases of using the steam thresher is the crossing of ditches and small streams in moving from place to place. The lighter machine with a gas motor as the power plant is much more convenient.

The ideal threshing plant is a small threshing machine that can be operated with a farm tractor. It does not thresh out the volume but neither does it involve a large amount of money. After the threshing season the farm tractor can be used for plowing or for operating stationery machinery.

Progress in the rice industry will involve many changes. Customs and practices that severed our fathers do not do in this day and generation. As the human forces are released from the burdens that weigh them down they should seek to followthe path of progress. Otherwise the extra leisure will do more harm than good.

Motor Cultivation in Indo-China

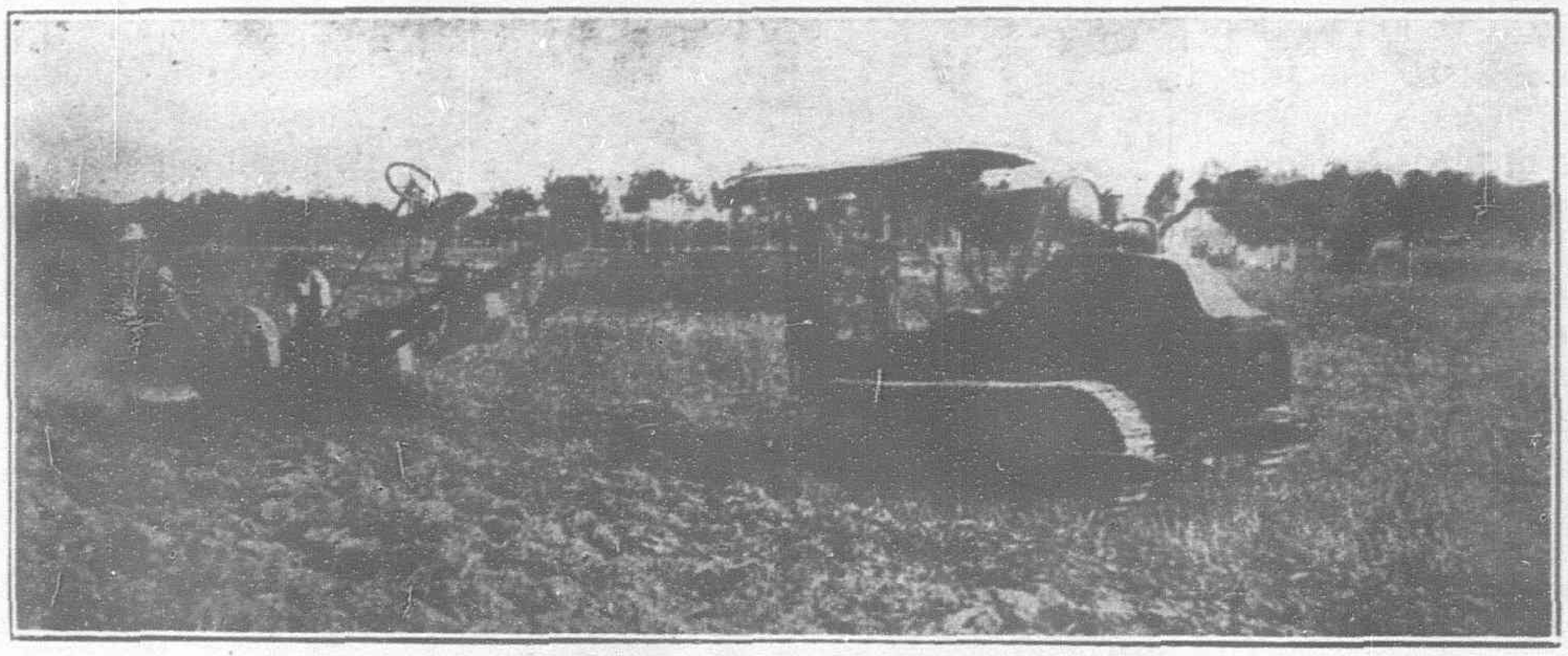
Disadvantages of the Existing Native Methods of Culture

THE introduction of modern methods of culture has always been difficult owing not only to the absence of labor in certain districts but also to the inefficiency of the work done by this labor when obtainable, as well as by the slowness of work in which oxen are engaged so that wide-awake colonists have followed with great interest the moevment in France and America towards the introduction of motor-culture.

It is chiefly in Cochin-China with its extensive rice-fields and its flat and relatively sparsely populated country where this need has been most felt. Furthermore, the vast trade of Saigon has brought much capital to the port, which naturally seeks for investment in the rich surrounding country.

First Attempts at Motor Culture in the Rice Fields of Cochin-China

Hitherto all work in the rice-fields has been done with the aid of buffaloes and it was quite natural that the colonists should try and find some substitute for this expensive animal which is by no means hardy and easily falls victim to epidemics, killing in a few days a third, or event half, of the herds.



Ploughing in Indo-China by Tractor

Towards 1900 an enterprising man with the aid of an engineer undertook trials of motor-culture on an extensive estate in the west of Cochin-China. Unfortunalety difficulties were continually cropping up, the floods of the Me-kong, stagnant ponds of rain-water and the difficulty of constructing appropriate tools—all contributed to bring the trials to an end after two years of courageous toil. Anyway the experience was not lost, as it showed that motor-culture is possible only where seconded by a preliminary series of public works. The water system of the country must first be controlled so as to prevent the land being flooded by the Me-kong and all superfluous rain water must be drained into the sea. To a certain extent the colonist can protect his land from flooding by surrounding it with dykes, but the drainage of a district necessitates large canals and these can be planned and cut only by a central authority, such as a public works department or a syndicate of estate owners. The only tools to be found at the time were a windlass driven by a petrol motor of small horse-power for winding a cable. Steam was out of the question as the water was full of sulphates and chlorides which would have soon destroyed the boilers, and, furthermore, the transport of wood across immense marshes full of tall acquatic plants and with a sub-soil of clay was practically impossible.

Steam Culture in Rubber Plantations

Some years later important rubber plantations were started in the east of Cochin-China on very rich land of volcanic origin, known as the "red lands." Here other difficulties cropped up: absence of labor in a country covered with forest of huge trees with in places thickets of thorny bamboos in interwined clumps of 10 or even 13-ft. in diameter and a soil full of roots, which combined were enough to dishearten the most sanguine of colonists. Men and animals were not equal to the task and so the aid of steam was invoked. Powerful steam tackle, of well-known type, consisting of two locomobiles together with steam windlasses for working a cable and clearing out the tree stumps, and steam traction engines such as are used on roads in Europe, was employed. By means of powerful scarifiers and extra-strong ploughs this virgin forest was cleared, and magnificant plantations of hevea—amounting to some several thousands of acres—took its place.

Here the use of steam was fully justified for numerous streams of pure water supplied excellent feed-water, while the forest itself supplied more than sufficient fuel.

Use of Explosion Motors

Over ten years passed before a fresh attempt was made about 1917. The war had called attention to the use of tractors run by oil, and the papers gave glowing accounts of their prowess, so that the department of agriculture in Cochin-China sent to America for a "Caterpillar Holt" tractor and a four-shared American plough.

During 1918 and 1919 trials of ploughing flooded rice-fields were made, thus simply following native methods substituting mechanical power for that of men and oxen. Thanks to the regularity and depth of the ploughing the yield was increased by 30 per cent., but the difficulties were enormous, for, although the tractor worked well, the heavy plough sank into the mud and when it came to turning it at the end of each haul, the Annamites were not physically strong enough, except with immense difficulty, to handle the plough which had been built for sturdy American laborers.

Profiting by the above experience new trials were made in 1920, but the American plough previously employed was replaced by a European balance-plough specially adapted for work in the rice-fields, according to data supplied by the author of this article. Further, as in European and American rice-fields the land is ploughed before it was inundated, the department of agriculture of Cochin-China decided to make a complete series of trials of both dry and wet ploughing, at depths varying from 5 to 10 inches on a large scale in the west of this colony, and they supplemented their existing plant by the acquisition of a light tractor. These trials were possible owing to the collaboration of the president of the syndicate of rice-growers and were carried on over about 200 acres, so that they were eminently practical and of real interest.

At the same time trials were made to determine what advantages there might be in ploughing up by mechanical power instead of by the time-honored yoke of oxen, marshes having a good soil hut covered with large weeds. As a matter of fact rice-fields are formed by the conversion of such marches into cultivated land and experiences has shown that in the past, from six to ten years are necessary for the usual chemical reaction to take place and bring the soil to complete fertility.

The trials showed that when these marshes are ploughed mechanically in the dry season they bring in a return from the second year after ploughing, the crops being largely sufficient to cover the cost of the petrol and the small hydraulic work, such as banks and ditches 4-ft. wide required, as already explained, to control the irrigation.

In old and fully-productive rice-fields working by oil power comes out more expensive than by oxen, but it should be noted that the quality of the machine work, in regard to depth and regularity, is above all comparison with the old, and the yield was increased by from 25 to 40 per cent. The rich Annamite growers followed the trials with the greatest of interest, ready, as soon as sure that they can obtain suitable tackle, to scrap their oxen and use tractors.

Further, rubber planters in seeking to plant other produce between their rubber trees, naturally turn to tractors, and in many plantations especially on the siliceous grey lands, tractors have ploughed deeper than was ever possible with oxen, these latter being employed only for light surface work. All of this goes to show that motor-culture in Cochin-China is a real live thing.

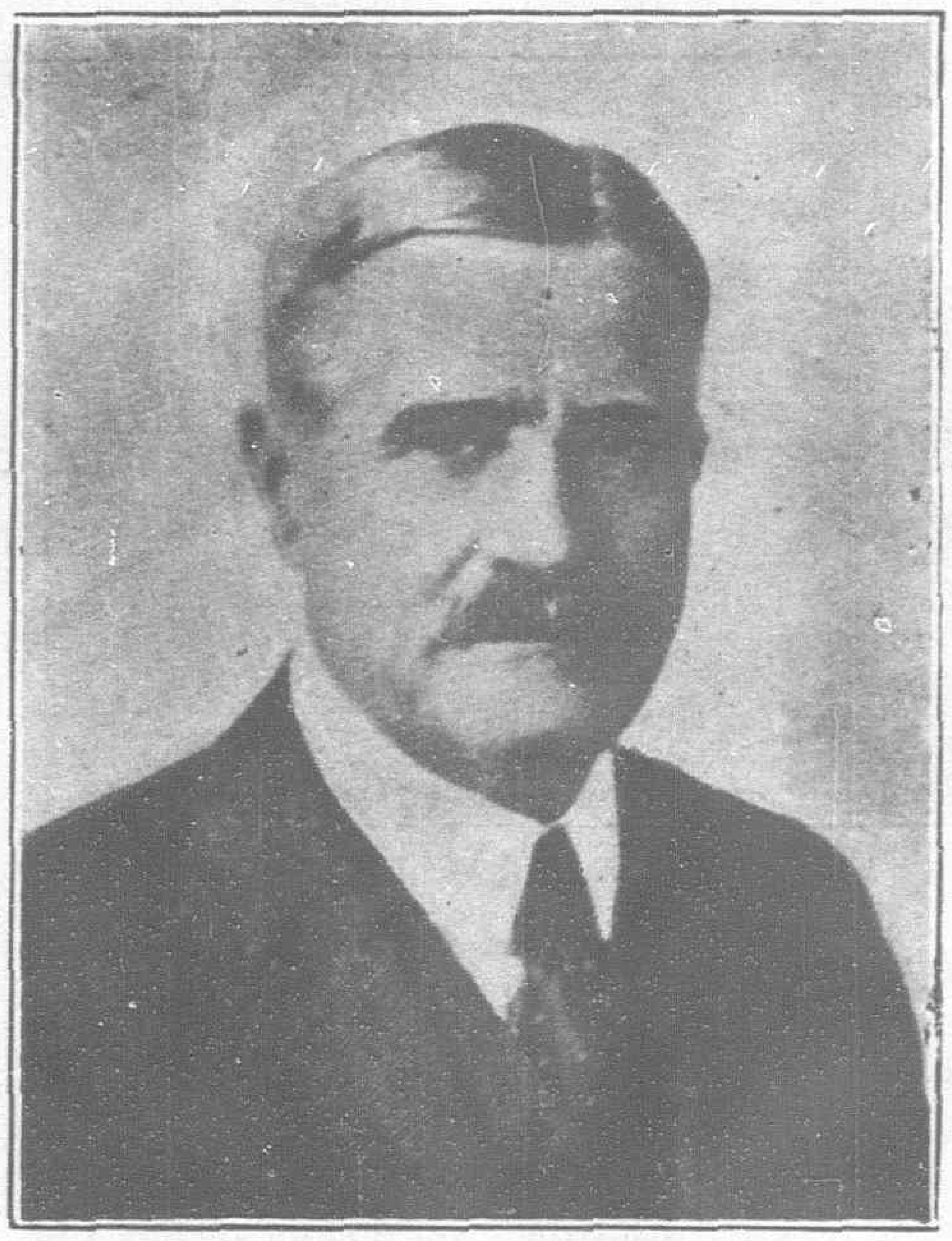
In Tonkin this question is much more complicated for the extreme smallness of the rice-fields, the lay of the ground in the coffee plantations and the abundance of labor all militate against the use of mechanical power. All the same, some interesting trials of motor-"bineuses" for working the land while the crops growing have taken place.

In Cambodia the experimental stage still exists, but it is probable that motor-culture will develop rapidly as the conditions are the same as obtain in Cochin-China—vast lands mostly level and but sparsely populated.

As may be seen, Indo-China has followed France very closely in adopting these new methods in agriculture. The government, also, by means of substantial subsidies, varying in their methods of application in each of the countries of the union, does all it can to encourage this movement. Without being too optimistic it may be predicted that within a few years the agricultural tractor will invade the colony as successfully as its elder brother the motor-car has done, especially in view of a recent improvement in carburetters enabling oil to be used in place of petrol without fear of fouling the motor. As combustion is complete the economy in the quantity of combustible used is over 20 per cent. and taking the prices of oil and petrol at Saigon at the beginning of this year, the economy in money would be nearly 65 per cent.

The Manila Railway

The Result of One Year's Operation Under Efficient Administration. An Argument Against State or Political Control



Colonel HENRY B. McCOY,
General Manager of the Manila Railway Co.

THE 1922 report of the Manila Railway Company stands as the highest testimonial to the wisdom of General Wood's business administration of the islands and the efficiency of the new management under Colonel H. B. McCoy who has been directly responsible for the working of the properties during the entire year with the exception of the first thirty days. The beneficial results of purely business methods as distinguished from political control is seen in the reduction of operating expenses effected during the year making possible a net profit of P.2,281,318 as compared with P.297,156 for 1921, an increase of P. 1,984,162, or nearly a million gold dollars.

The operating revenues for 1922 amounted to P.12,210,797 a decrease of P.63,000 under the previous year, yet despite this falling off in revenues the saving was made by cutting down the expenses which in 1921 were P.9,506,807 and in 1922, P.7,300,646, a decrease of P.2,206,160. The net operating income, after deducting taxes and bad debts was P.4,887,748 as against P.2,767,228 in 1921, an increase of P.2,120,519. This commendable showing is further emphasized by the following recapitulation of the comparative income statement for 1921-22 :—

Total operating revenues for 1922 were	P.12,210,797.77	
A decrease under revenues for 1921 of	63,500.92 or	.52 of 1%
Total operating expenses for 1922 were	7,300,646.83	
As against	9,506,807.12	
For 1921, a reduction of	2,206,160.29 or	23%
Total operating income for 1922 was	4,887,748.32	
As against	2,767,228.72	
For 1921, an increase of	2,120,519.60 or	76.6%
Total non-operating income for 1922 was	233,965.11	
As against	213,973.96	
For 1921, an increase of	19,721.15 or	9.2%
Total fixed charges and extra deductions were	2,783,405.16	
As against	2,718,309.13	
For 1921, an increase of	65,096.03 or	2.39%
Total net income for 1922 was ..	2,338,038.27	
As against	262,893.55	
For 1921, an increase of	2,075,144.72 or	789%

The above is a very striking illustration of the manner in which reduced expenses increase net income. It will be noted that the variation in total operating revenues was almost negligible (i.e., 0.52 of 1 per cent.) whereas a 23 per cent. reduction in expenses resulted in increasing net income almost eightfold (789 per cent.), even though fixed charges and extra deductions increased 2.39 per cent. Expressed differently, income is limited to the amount of traffic offered and the capacity to handle it, while outgo (expenses) is measureably subject to control. The proper exercise of such control is one of the main functions of management. Operating ratio (proportion of operating expenses to gross operating revenues) was 59.8 per cent. for 1922 as against 77.45 per cent. for 1921. Operating ratio of all Class I railroads in the United States combined for 1922 was 74.89 per cent.

Reduction in operating expenses during the year was the result of (*a*) reduction in salaries and wages paid and reduction in actual quantity of operating supplies used; and (*b*) reduction in the cost of operating supplies.

The comparison in the consumption of coal and lubricants demonstrates the efficiency of the new administration and from this distance it would appear that considerable graft or gross extravagance and supervision characterized the political administration of the company, when a saving of P.1,333,725 could be effected in the item of operating supplies alone. The total saving in the cost of coal was P.1,266,502 of which P.446,999 was the result of greater economy in quantity consumed and P.819,612 due to saving in pcrie.

In the matter of personnel, there were 1,929 regular employees receiving monthly salaries, a reduction of 100 from the year 1921, and 4,235 daily paid employees, or a total of 6,164 on the company's pay roll. Large reductions in the number of daily paid employees were made by closer co-ordination of duties and elimination of unnecessary labor and sinecures. As usual in state-owned or politically-directed enterprises, the sentiment had been allowed to develop among the employees of the company that the railroad existed primarily for their benefit, a Filipino application of the soviet principle, or their idea of what a republic or self-government should do for them. The reversal of this attitude has fortunately been effected with benefit to all concerned and the efficiency of the service

MANILA RAILROAD COMPANY

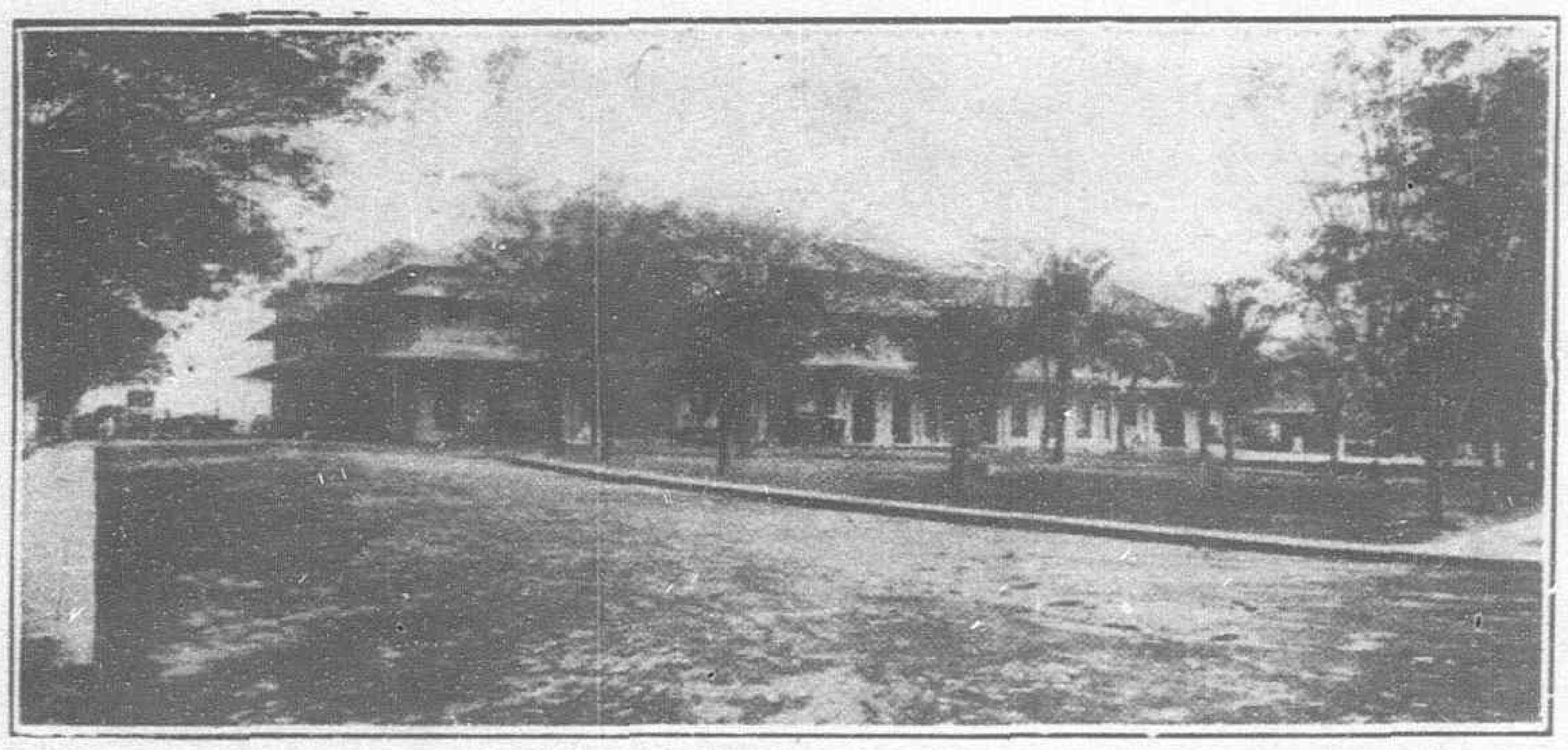
STATEMENT OF CONSUMPTION OF COAL AND LUBRICANTS SHOWING AMOUNT OF INCREASE AND DECREASE AND PERCENTAGE OF CHANGE FROM PREVIOUS YEAR AND AMOUNT AND PERCENTAGE OF SAVING WITH RESPECT TO QUANTITY AND CHANGE IN PRICE.

	1921		1922		Increase (+) or Decrease (—)				Distribution of Savings			
									Saving in consumption		Saving in price	
Articles	Quantity	Amount Pesos	Quantity	Amount Pesos	Quantity	Per cent. of change from previous year	Amount Pesos	Per cent. of change from previous year	Amount Pesos	Per cent.	Amount Pesos	Per cent.
Coal (tons)	83,618	2,929,118.67	70,454	1,662,516.40	—13,164	—15.74	—1,266,602.27	—43.24	446,990.06	35.29	819,612.21	64.71
Oil engine	46,625	52,972.39	30,932	25,289.07	—15,693	—33.66	— 27,682.42	—52.26	17,116.83	61.83	10,565.59	38.17
Oil axle	63,511	47,696.76	51,254	35,690.08	—12,257	—19.30	— 12,006.68	—25.17	9,205.03	76.67	2,801.65	23.33
Oil cylinder, superheater	8,130	15,788.95	8,594	20,997.41	+ 464	+ 5.71	+ 5,208.46	+32.99	*1,134.20	21.78	*4,074.26	78.22
Oil cylinder, ordinary ...	13,835	14,284.83	6,652	8,753.38	— 7,183	—51.92	— 5,531.45	—38.72	5,531.45	100.00	...	...
Oil signal	11,149	12,999.60	8,363	8,078.54	— 2,786	—24.99	— 4,921.06	—37.86	3,255.01	66.14	1,666.05	33.86
Oil kerosene	35,699	32,997.17	30,856	17,083.95	— 4,843	—13.57	— 15,913.22	—48.23	4,838.88	30.41	11,074.34	69.59
Gasoline	17,064	17,882.14	13,344	11,603.96	— 3,720	—21.80	— 6,278.18	—35.11	3,966.16	63.17	2,312.02	36.83
Total Decrease ...	...	...	...	...	...	...	1,333,726.82					

*Increase.

Note.—Quantity of all items is given in gallons, except coal which is given in tons.

Luzon Island and Lines of the Manila Railroad Company



Manila Terminal Station

Paco Station

increased materially due to better supervision and improved morale. Increased ability and efficiency of employees means an increase in salaries and wages paid, and during the government control of the railroad the average wages paid in 1916 as compared with 1922 shows that station agents which formerly received P.477 are now receiving P.834 : conductors, P.444 now 744 and locomotive drivers, P.540 and now P.1,116. No decrease in the wages paid was made during 1922 but rectifications will be made in this year that will bring about an adjustment.

The total saving of P.2,206,160 under the new administration is made up of the P.133,726 in operating supplies : P.387,965 in decrease in salaries and wages : P.50,807 in stationary and office supplies : P.127,714 in cost of ties and P.305,945 in miscellaneous supplies and other economies. The following statement shows comparison by sources of operating revenues for the years 1922 and 1921 :—

	1922	1921	Increase or Decrease
Passenger	P. 5,430,631.25	5,955,975.45	P.525,344.20
Freight	5,602,576.39	5,032,275.39	570,301.00
Express	690,578.80	797,225.92	106,647.12
Water Lines ..	174,588.86	192,484.52	17,895.66
Miscellaneous ..	312,422.47	296,337.41	16,085.06
Total	12,210,797.77	12,274,298.69	63,500.92

The number of passengers carried in 1922 was 6,501,363 as compared with 6,956,149 in 1921, a decrease of 454,786 or 6.5 per cent. The number of passengers carried in 1921 represented a decrease of 25 per cent. from the total carried in 1920, evidence that passenger traffic has been severely affected during the past two years attributable to continued and increasing competition on the part of motor buses and the commercial depression prevailing since the latter part of 1920. Fortunately the decrease in passenger traffic was more than offset by the increase of P.570,301 in freight income.

The ever growing competition of the motor trucks in the matter of transportation of passengers and express freight is seen in the consequent reduction of the railroad revenues derived from these two sources. This loss is offset somewhat by the traffic which these trucks assist in developing when they act as feeders to the railway. In complaining about these conditions and offering suggestions to avoid unfair competition the railway authorities insist on a policy on the part of the government not to construct roads parallel to the railroad. Such a policy they contend, will undoubtedly limit the motor competition to sections where existing highways now parallel the railway and will at the same time enable the government to construct urgently needed highways in many parts of the islands where no means of communications now exist. The railway company declares that it has spent tens of millions of pesos originally and pays out annually hundreds of thousands in maintaining its track and right of way. Twelve per cent. of its income is the average amount devoted to this purpose. It is true they point out, that the railway track is for the exclusive use of the railway company, but a large proportion of the moneys expended for maintenance is in the form of wages to workers, which is spent in the communities in which they live. It is believed by the railway administration that the license fees and taxes paid by the truck owners permitting them to use the public highways, are insignificant in proportion to the benefits they derive from such use and the constant damage to the roads that they cause. For this reason, it holds that legislation be enacted that will exact from the owners of motor vehicles something like a fair and just proportion of the upkeep of the public highways they utilize.

With regard to the disposition of the profits made by the company the president recommends that they be expended on important improvements and betterments of existing lines essential to the economical and efficient operation of the road. With this end in view a comprehensive improvement program is being worked out.

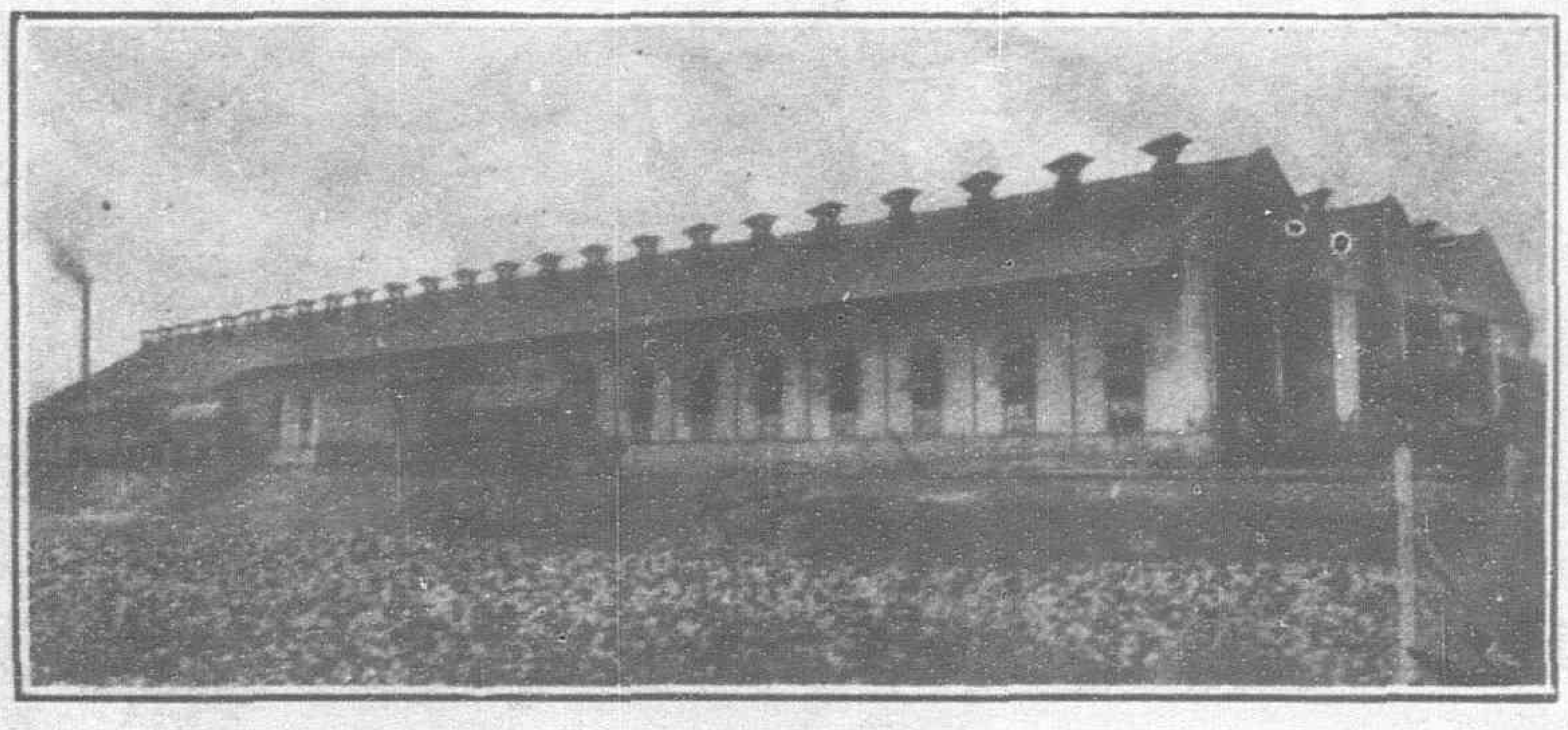
In regard to the finances, when the road was first taken over by the government in 1917 a deficit of P.1,480,390 was taken over and also a heavy deferred maintenance obligation assumed. The profits of the company from 1917 to 1921 have been applied almost entirely to the payment of this deficit and a considerable amount of moneys available for expenditure had to be utilized not only for the extension of existing lines but also for important repairs, improvements and betterments of road as well as for the replacement of unserviceable rolling stock.

New Financing

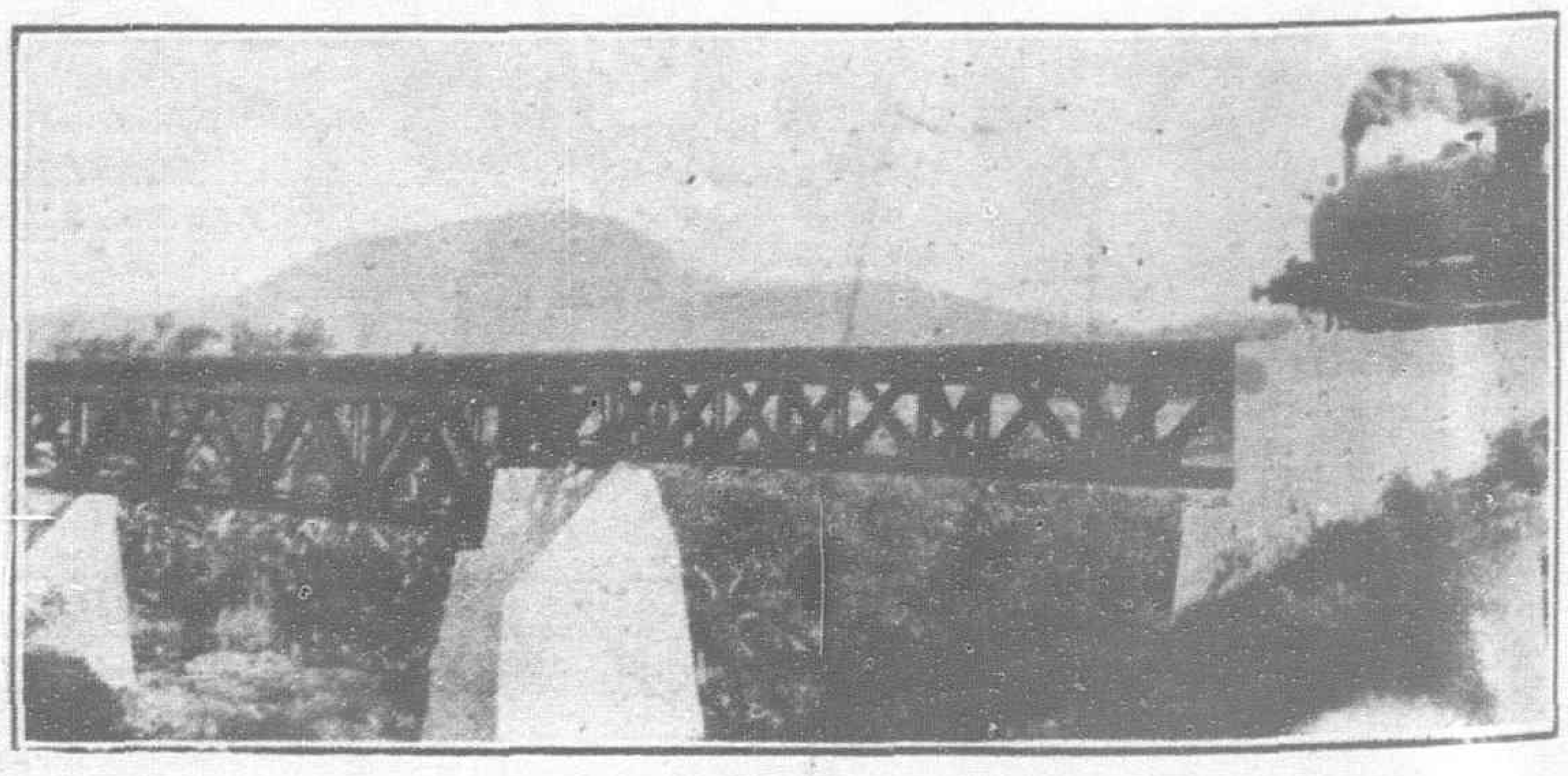
Early in the year 1922 it became urgently necessary to devise and carry out a plant to raise funds, both to liquidate past indebtedness and to continue construction work then in progress. During the year 1921 short-term loans had been contracted to the extent of P.2,700,000 as follows :

P.2,000,000 Chase National Bank, New York .... due April 7, 1922
700,000 Philippine National Bank Manila....due Jan. 26, 1922

In addition, the sum of P.1,689,741.40 had to be paid during the months of Feb., Mar., and Apr., 1922, to cover drafts for coal, bond interest and settlement of accounts for supplies in the United States

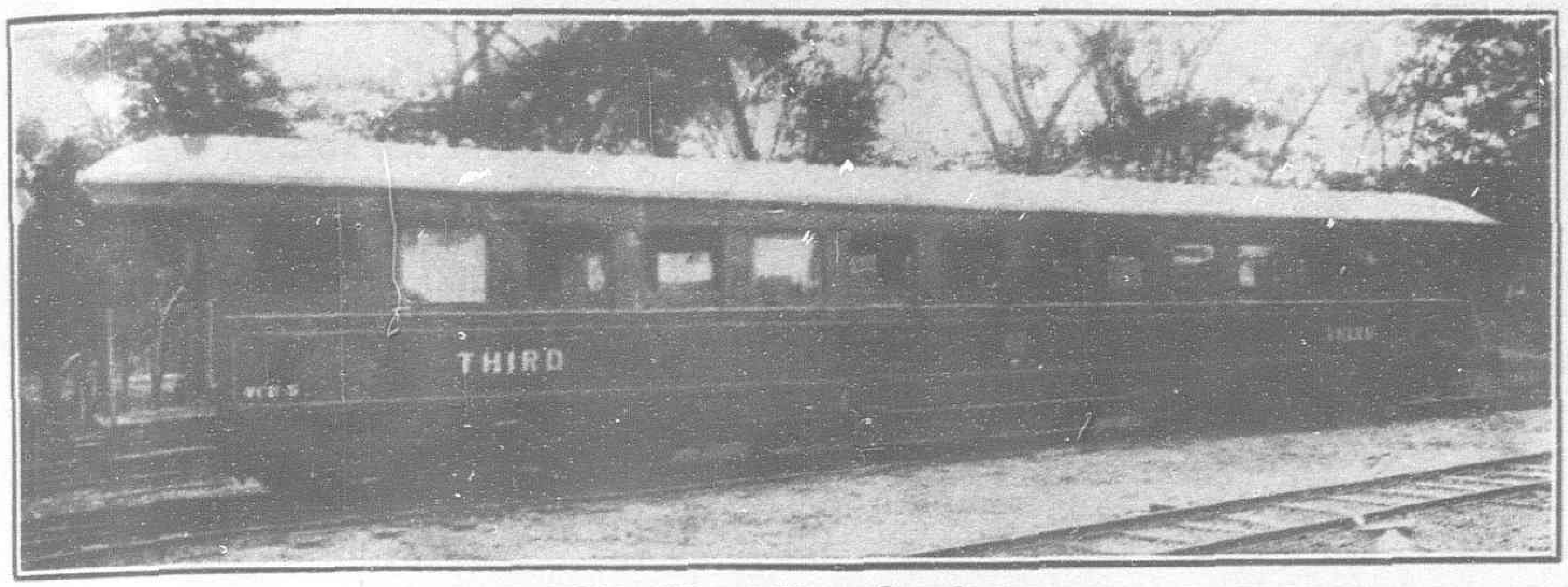


Manila Engine Shed

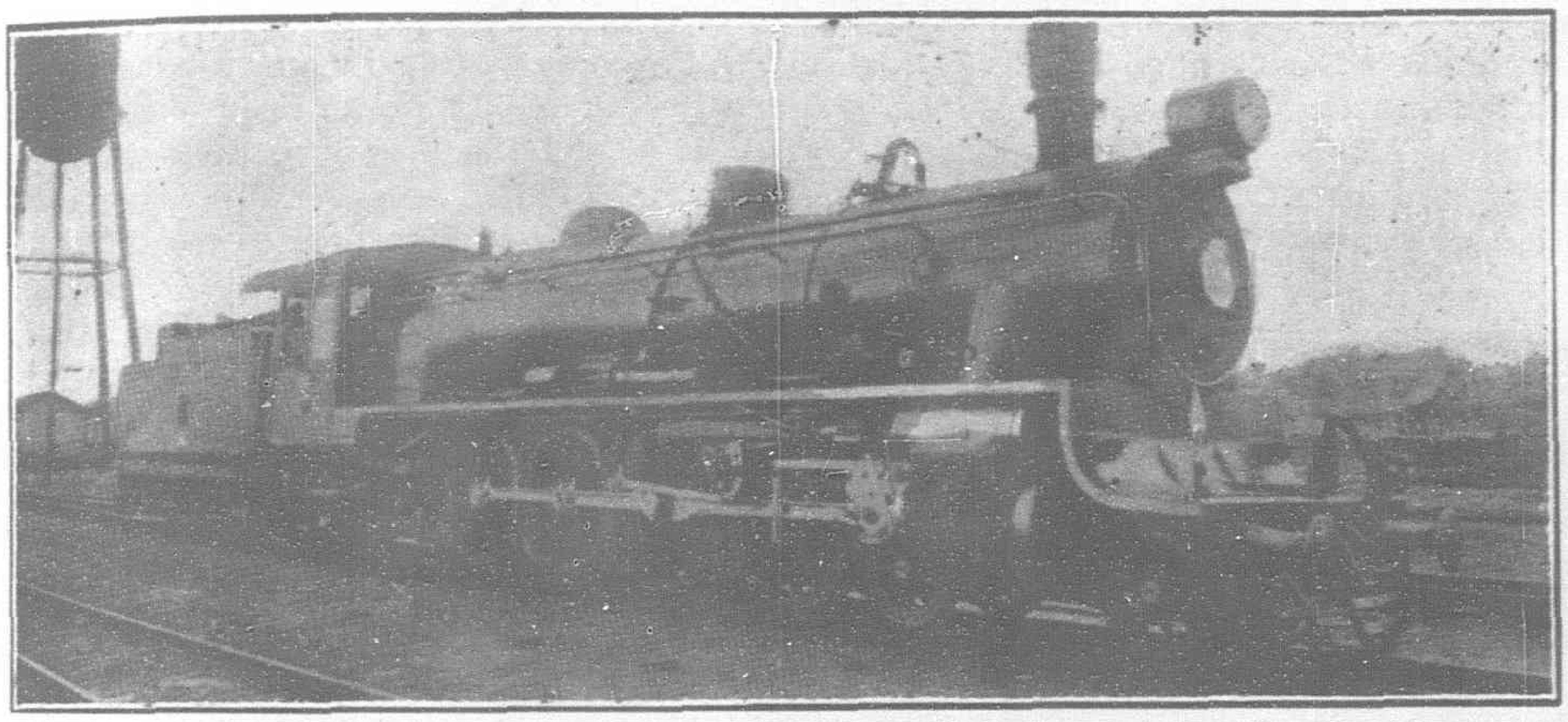


Steel Bridge on Concrete Pier, Los Banos-San Pablo Cut-off

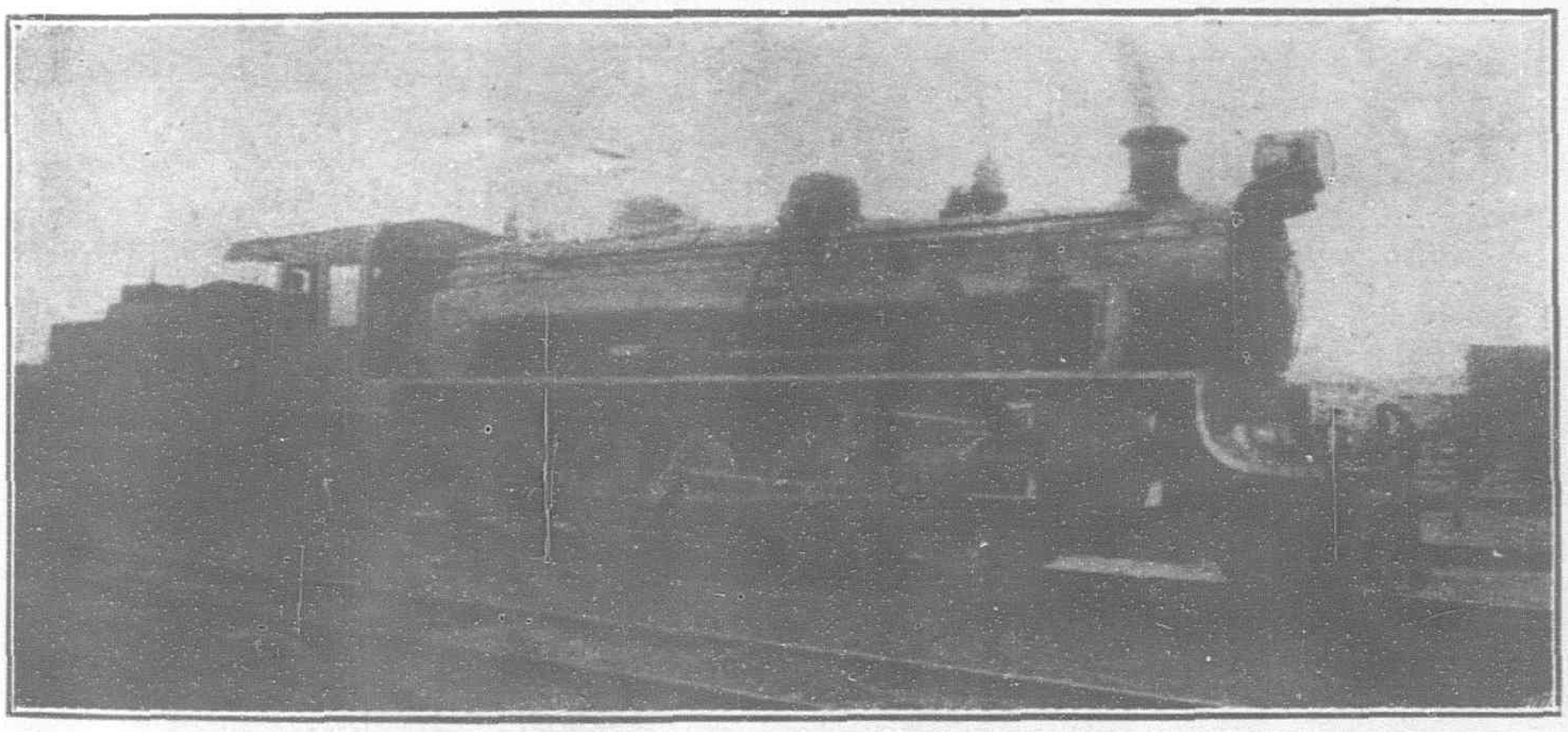
A plan had been proposed to issue P.8,000,000 par value 7 per cent. 18-year sinking fund bonds, supplemented by a subscription on the part of the insular government to additional stock to the amount of P.2,000,000. The financial condition of the government was such as to render this subscription impracticable, however, and the issuance of sinking fund bonds to the amount of P.8,000,000 would have meant an addition of approximately P.1,000,000 per annum to the fixed charges of the Company. The assuming of this increased fixed annual obligation would have been extremely inadvisable. The amount of bonds outstanding is disproportionate to the amount of stock and an additional issue to the extent of P.8,000,000 could simply further weaken the existing financial structure.



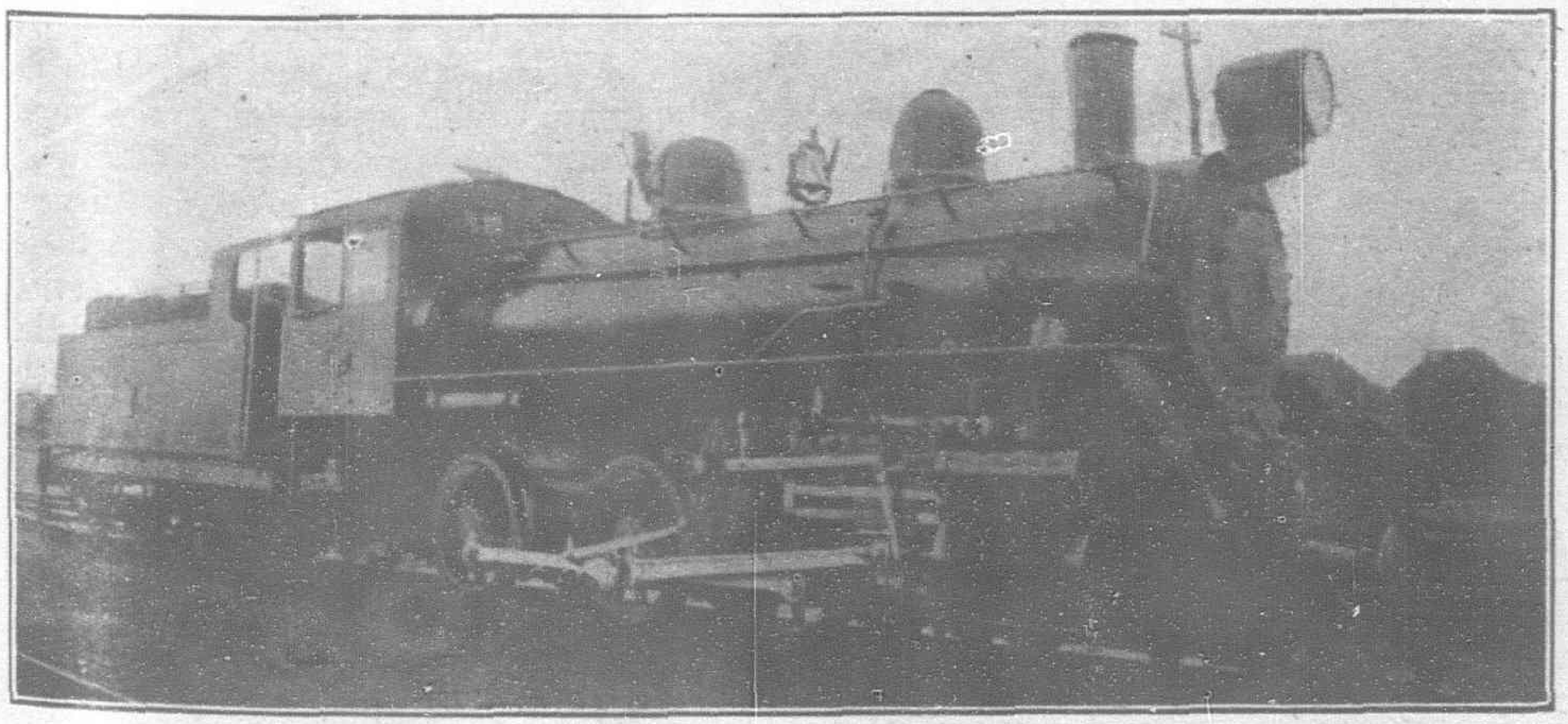
New Third Class Coach



American Locomotive Company "Mountain" (4-8-2), Type Locomotive, Tractive Power, 25,200 Pounds; Weight (exclusive of Tender), 83.18 Metric Tons



American Locomotive Company "Santa Fe" (2-10-2), Type Locomotive; Tractive Power, 31,500 Pounds; Weight (exclusive of Tender), 85.45 Metric Tons



H. K. Porter Co. (American) Locomotive, Type 4-6-0; Tractive Power, 15,840 Pounds; Weight (exclusive of Tender), 41.74 Metric Tons

The present management therefore proposed the following plan, which was adopted: The issuance of P.3,000,000 7 per cent. refunding bonds, payable in 15 years, the sinking fund and interest to be guaranteed by 4 per cent. southern lines gold bonds to the amount of P.5,622,000 which were being held by the Chase National Bank as surety for the payment of the P.2,000,000 due on April 7, 1922; the money received from the sale of these bonds to be used for the payment of the loan due the Chase National Bank, for the continuation of the construction work on the Los Baños-San Pablo cut-off and the reduction of the loan of P.700,000 from the Philippine National Bank. It was also contemplated that a subscription of P.1,000,000 by the insular government for additional stock might be arranged.

The negotiation of this bond sale was successfully conducted, the entire issue being subscribed for jointly by Messrs. Hallgarten & Company and the Chase Securities Corporation, both of New York City, at a price of 107.047 plus accrued interest. The proceeds of the sale amounted to $1,650,038.40 or P.3,300,076.80, a premium of P.300,076 80 over the face value of the bonds.

Pending the consummation of this sale the loan of P.700,000 from the Philippine National Bank had been extended, and it was promptly liquidated when the proceeds became available. The completion of this financing, together with current receipts from operation, enabled the Company to pay off the bank loans of P.2,700,000, continue the construction work on the Los Baños—San Pablo cut-off, and take care of all indebtedness in the form of interest on bonds, bills payable for supplies and drafts for coal. This was accomplished with an additional interest charge of P.210,000 per annum and the creation of a sinking fund running for 15 years. This sinking fund will retire the issue at maturity.

Equipment: Rolling Stock

The following statement shows the number of locomotives and cars of all types on hand at the end of 1922 :—

Passenger coaches	197
Baggage and passenger brake vans	55
Freight cars	1,882
Service cars	51
Total cars	2,185
Locomotives	155

Construction

There are still 144 kilometres of railroad to construct to complete the lines already planned, as follows :

	Kilometres
Main Line North, Bauang Sur to San Fernando, La Union..	16
Tayug Branch, San Quintin to Tayug	8
Main Line South, Aloneros to Pamplona	120
Total	144

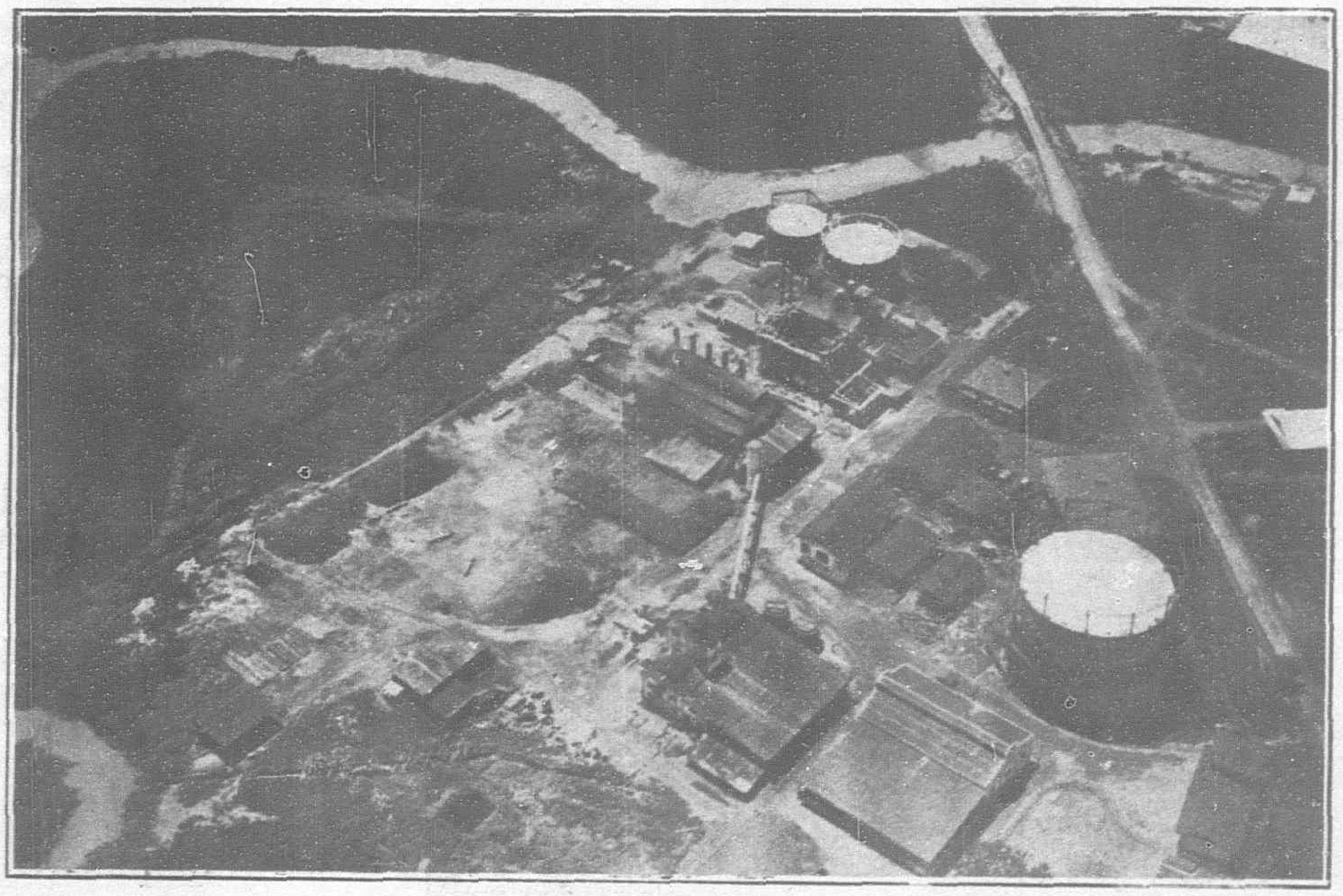
(*Continued on page 389*)

The Manila Gas Works

INCORPORATED in 1912 under a fifty-year franchise, the Manila Gas Corporation has developed from 1,183,000 cubic metres output in 1913 to 7,608,000 in 1922, supplying at the present time over 7,600 consumers. Although the sum of Pesos 814,725 was expended on new construction in 1922 another Pesos 300,000 will be required for the current year to improve and extend the plant, when it will be one of the most up-to-date in the Orient.

The capital of the corporation is Pesos 1,500,000 with first mortgage 5 per cent., thirty-year debentures outstanding redeemable in 1942 at 105. The operating revenues for 1922 were P.1,250,076 and expenses P.772,601 and with net profit on showroom of P.7,091 left P.484,556 for distribution. After setting aside interest on debentures and current accounts, depreciation, and special depreciation, and amortization appropriations, there was a net profit for the year of P.78,289.

The original plant consisted of a retort house, containing five benches of nine retorts each, an apparatus house, a meter house with one station meter, three purifying boxes, and a gas holder of 7,000 cubic metres capacity. Only coal gas was produced up to June, 1917, when the production was increased by the addition of a new water gas plant. From November 15, 1913, to December 31, 1914, the entire production was only 1,800,000 cubic metres.


Aeroplane View of Manila Gas Plant, Taken Before the New Water-Gas Plant was Completed

The number of customers had increased to 3,400 in 1916, and the gas consumption for that year to about 3½ million cubic metres. With the steady increase in demand for gas service it became necessary to enlarge the plant to supply it. To carry out this enlargement program the corporation added a new water gas plant consisting of water gas sets, each complete with generator, carburetter and superheater, two purifying boxes, a scrubber, relief gas tank of 700 cubic metres capacity, and the necessary blowers, exhausters, steam boilers, etc., required in the manufacture of this gas.

To demonstrate the steady growth of the gas industry in Manila the following record of gas production and increase in number of consumers is shown:—

Year	*Production*	*No. of consumers.*
1913-14	1,183,000 cu. m.	1700
1915	2,424,000 ,,	2900
1916	3,404,000 ,,	3400
1917	3,892,000 ,,	4300
1918	5,176,000 ,,	4600
1919	5,583,000 ,,	5400
1920	6,745,000 ,,	6400
1921	7,239,000 ,,	7300
1922	7,608,000 ,,	7600

The past two years the demand for gas service from those districts having no main pipes became so insistent that another enlargement of the plant became necessary. Beginning in the latter part of 1921 with the installation of a high-pressure booster system, in order to supply a better pressure to the northern part of the city, the following year, 1922, was one of steady construction. New building for additional water gas machinery, boiler house, purifier building, enlargement of the meter house and several other necessary buildings were erected. A new relief gas holder of 1,000 cubic metres capacity and 500-ton steel tanks for the storage of crude oil were erected.

New machinery and apparatus installed also included one new water gas set having hourly capacity of 1,100 cubic metres, two turbine air blowers, two steam-driven gas exhausters, three concrete purifier boxes, tar separator, scrubber, two new steam boilers and a new station meter. This enlargement program and construction activities will be continued during 1923.

A new main gas holder of 10,000 cubic metres capacity is now in the course of construction. The foundation, which rests on 1,400 piles 38 feet in length has already been completed. The holder will probably be completed and put into service during July or August, 1923.

With the new plant and equipment in operation, the laying of new pipes was begun January, 1923. At present the district of Santa Ana is being newly piped, and the piping in Tendo, Santa Mesa, Santa Cruz and San Lazaro districts is being considerably extended. Several of the well populated streets in these districts will be piped during this year. The 1922 improvement cost the corporation P.850,000, and it is estimated that P.300,000 will be spent this year.

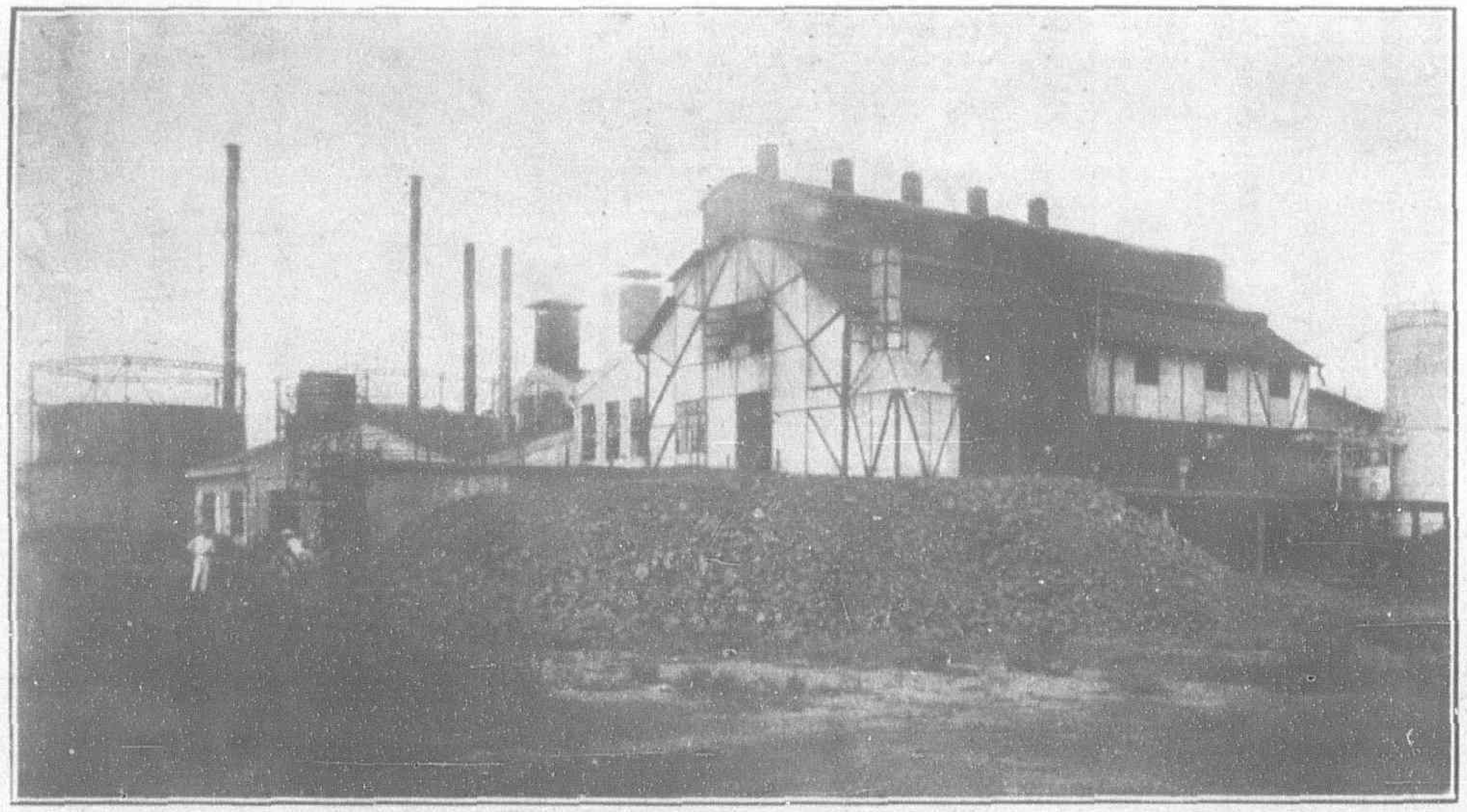
The corporation started business in 1913, with about 31 kilometres of main pipe which was increased to 80 kilometres before the end of 1914. The present length of the main pipe system is 110 kilometres. January 1, 1914, there were only 834 house supplied with 12,950 metres of house connections and with 114,122 metres of house connection pipe. A greater increase, however, is shown in house installations; on January 1, 1914 there were 903 installations with 23,811 metres of installation pipe compared with 11,371 installations with 235,874 metres of installation pipe on January 1, 1923. The total length of pipe in house connections and installations is 350 kilometres.

It may be of interest to note that the raw materials, coal and crude oil, used in manufacture of gas must be imported. Coal is obtained from Australia and Japan, while crude oil comes from British North Borneo. Adequate supplies of these articles were somewhat limited during the war period causing some inconvenience. Now that conditions have changed and immense quantities of these essential raw products are available on short notice, better service and further expansion are assured. As an additional safeguard the corporation carries a generous surplus as a matter of protection against probable shipping difficulties, strikes of miners, etc.

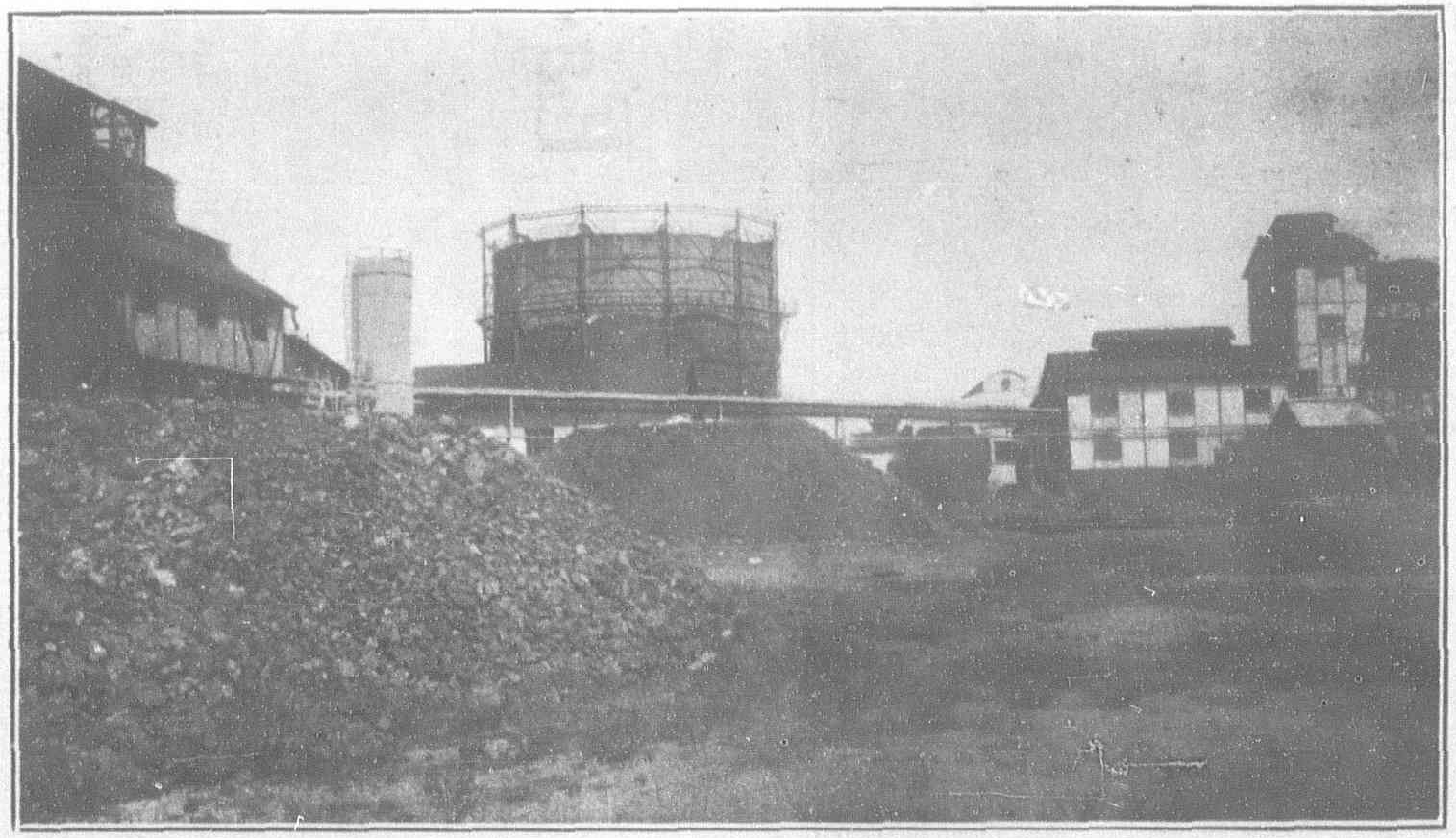
Because of its all-around efficiency gas is constantly gaining new ways of usage. Formerly most of the gas consumed was for cooking purposes in private homes. Later the leading hotels, clubs and restaurants seeing a greater efficiency in the use of gas had installations made. Candy manufacturers, tinsmiths, nickel and silver-plating works, bakeries, hospitals, convents, laundries, cleaning and dyeing establishments, tobacco factories and numerous

(Continued on page 389)

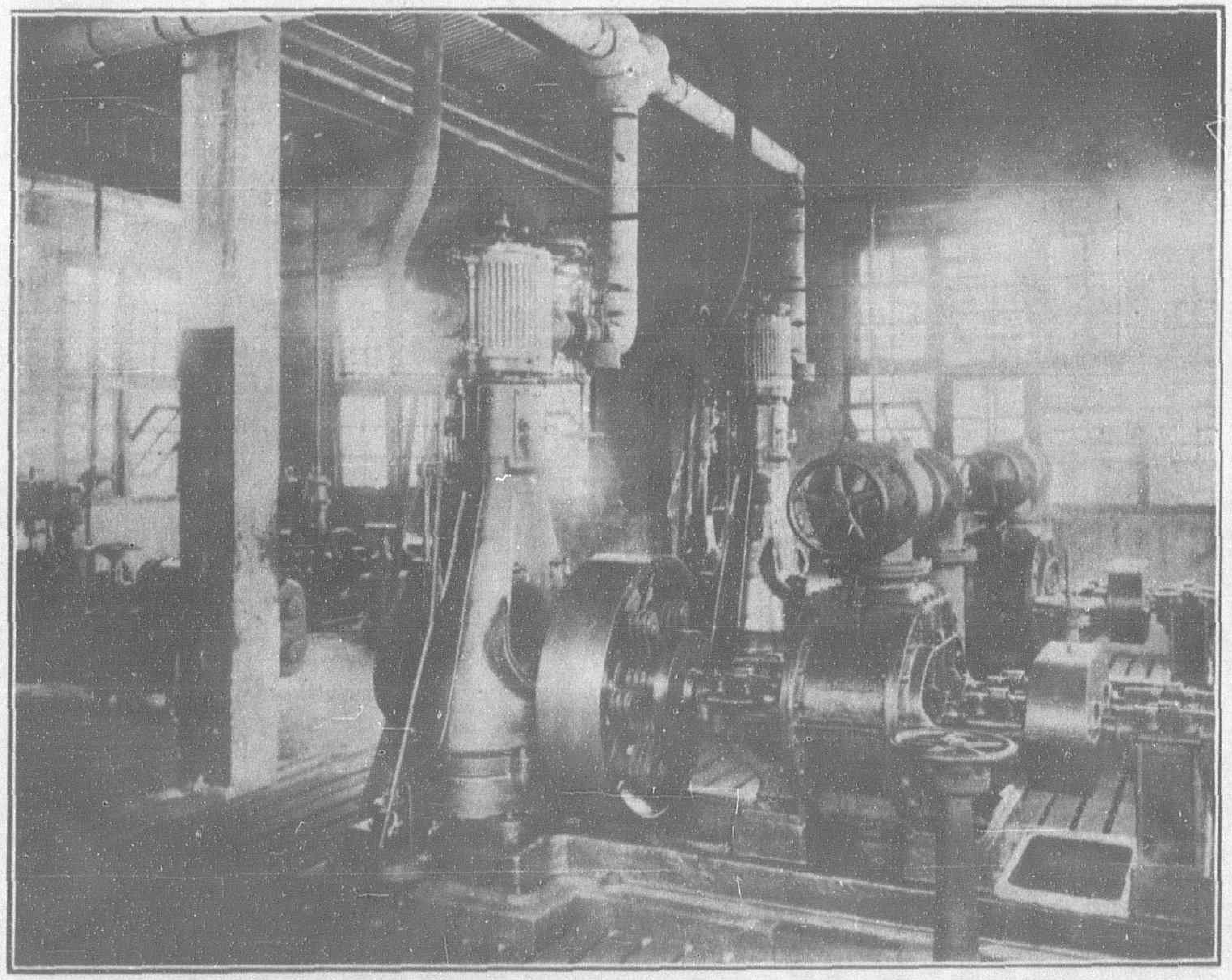
THE MANILA GAS WORKS



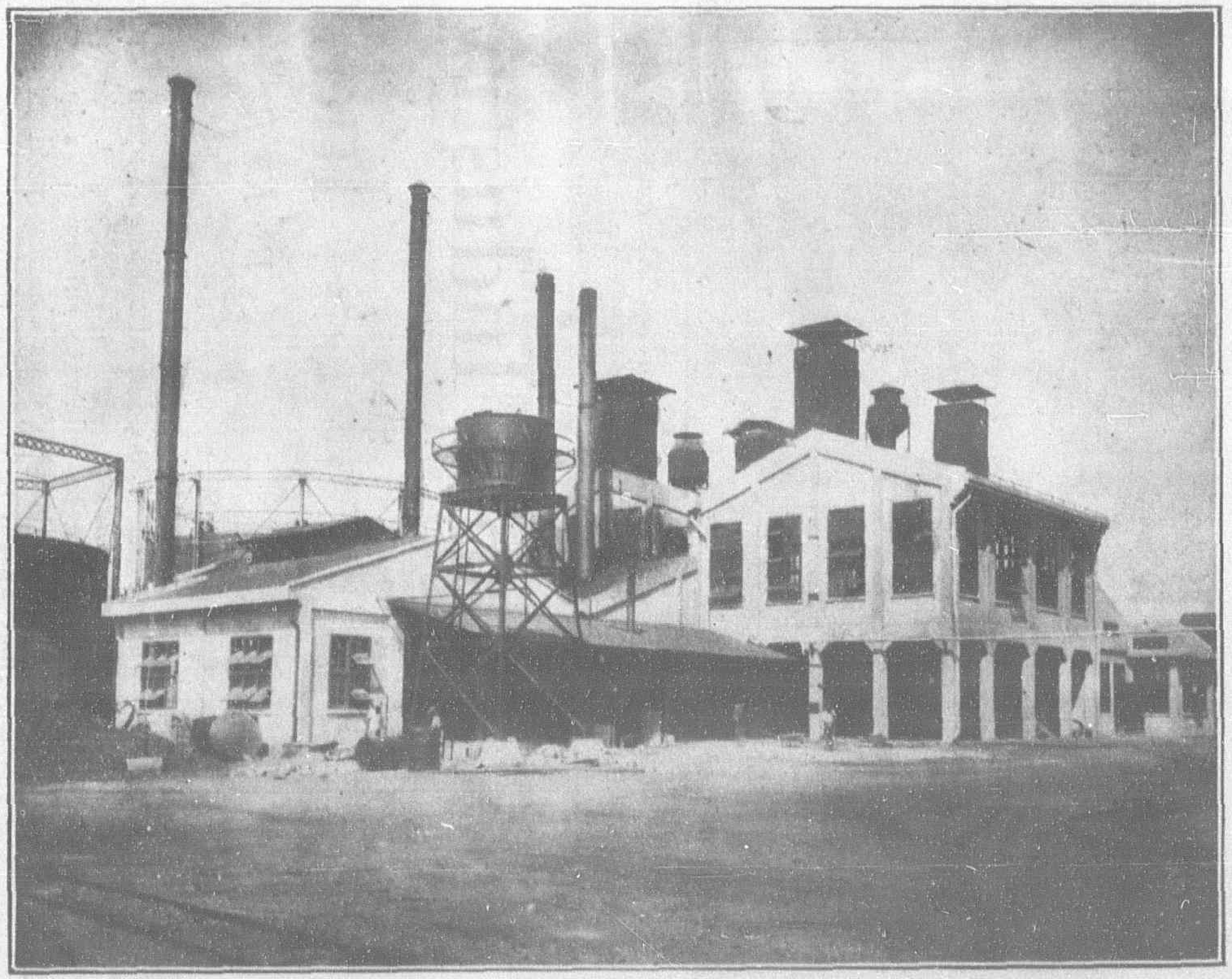
Coal Gas Plant



Apparatus House and Tar Tanks

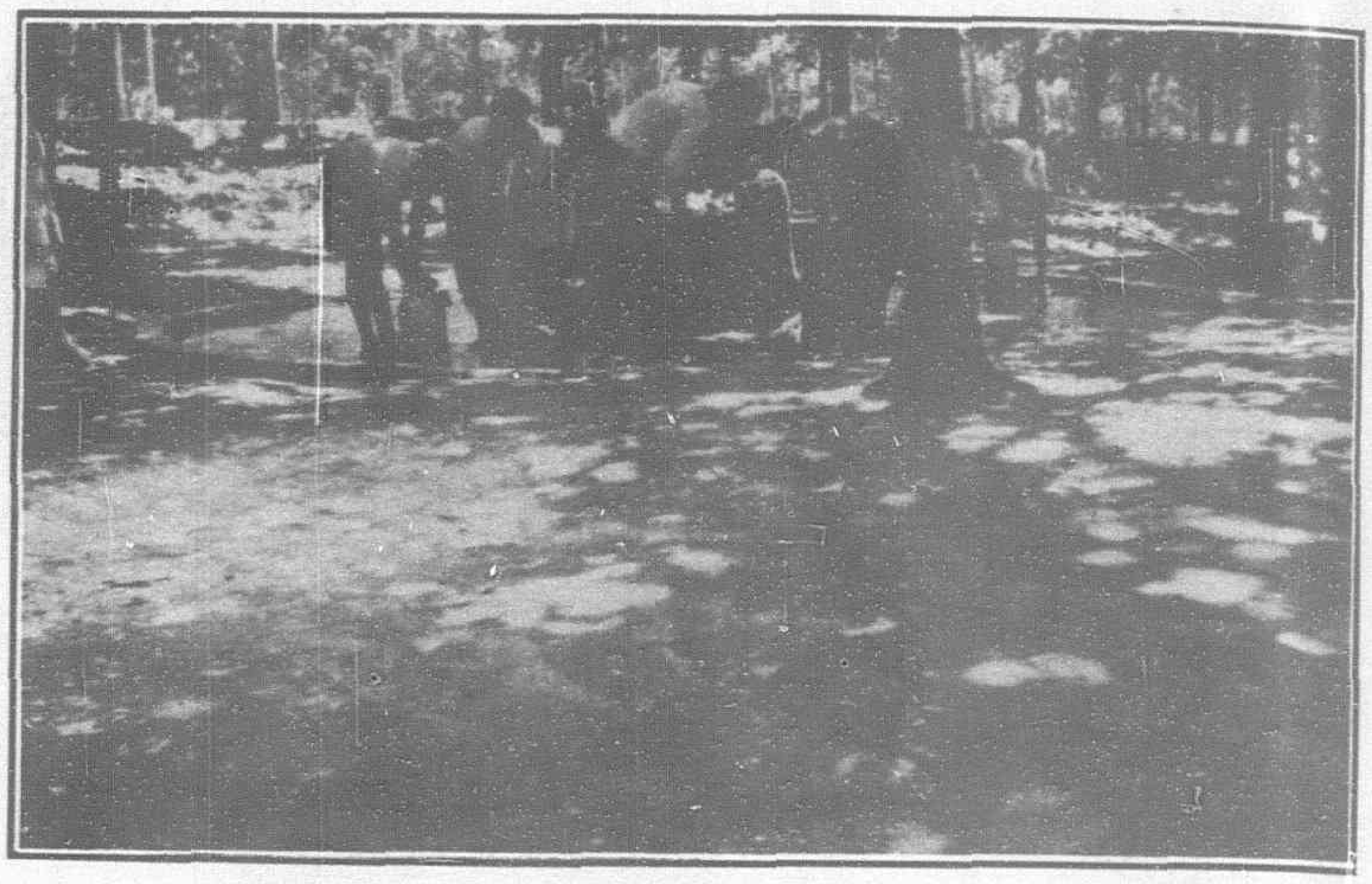


High Pressure Machinery: Pumping Gas under High Pressure Through 3,800 metres of Pipe to an Underground Governor Station



Carburetted Water Gas Plant and Boiler House. The Tower Tank in Foreground is the Storage for Boiler Fuel (Water Gas Tar)

Motor car for inspecting the Rubber Plantations near Kisaran, Sumatra, owned by the U.S. Rubber Company



Washing the tins used to collect the latex from the cups attached to the rubber trees

The Rubber Industry in the Dutch East Indies

By K. R. F. Blokzeyl

THERE is certainly no planting industry in the Dutch East Indies which, since 1905, has attracted so much attention as that of rubber.

The first attempts to cultivate rubber trees in these colonies were made with ficus elastica, producing the so-called Assam rubber, and thereafter with other kinds, including Hevea Brasiliensis, which latter variety is now generally recognized as to produce the best quality of rubber. Castilloa elastica and various Manihot species were also introduced, viz., from Mexico and Latin America respectively, and although cultivation of these latter attained at some time considerable dimensions, the areas under same are to-day, as compared with Hevea, not worth mentioning.

It was short after the year 1905 when the planting of rubber in Java received its first great impetus, as the results obtained by neighboring countries at that time aroused considerable interest in the matter. Capital invested in the industry increased rapidly, resulting in the opening up of numerous estates, both in Java and in the other islands of the archipelago, and when in 1910 prices of rubber had risen to such an extent as to occasion a boom, many plantations changed hands and became the property of foreign (for the greater part British) companies, whereas a great number of coffee lands were converted into rubber plantations.

After 1913, however, conditions became healthier and the development of the industry is since progressing undisturbed and on sound lines. The drop in the market prices which took place a few years ago, put an end to the all too rapid extensive development, but did not endanger properly organized enterprises which were left with an ample margin for profit. As a result of this, attention has been chiefly centred on the questions of how to reduce the cost of production in the rubber industry and of how to improve the product itself.

Tapping rubber trees: half Herring-bone system

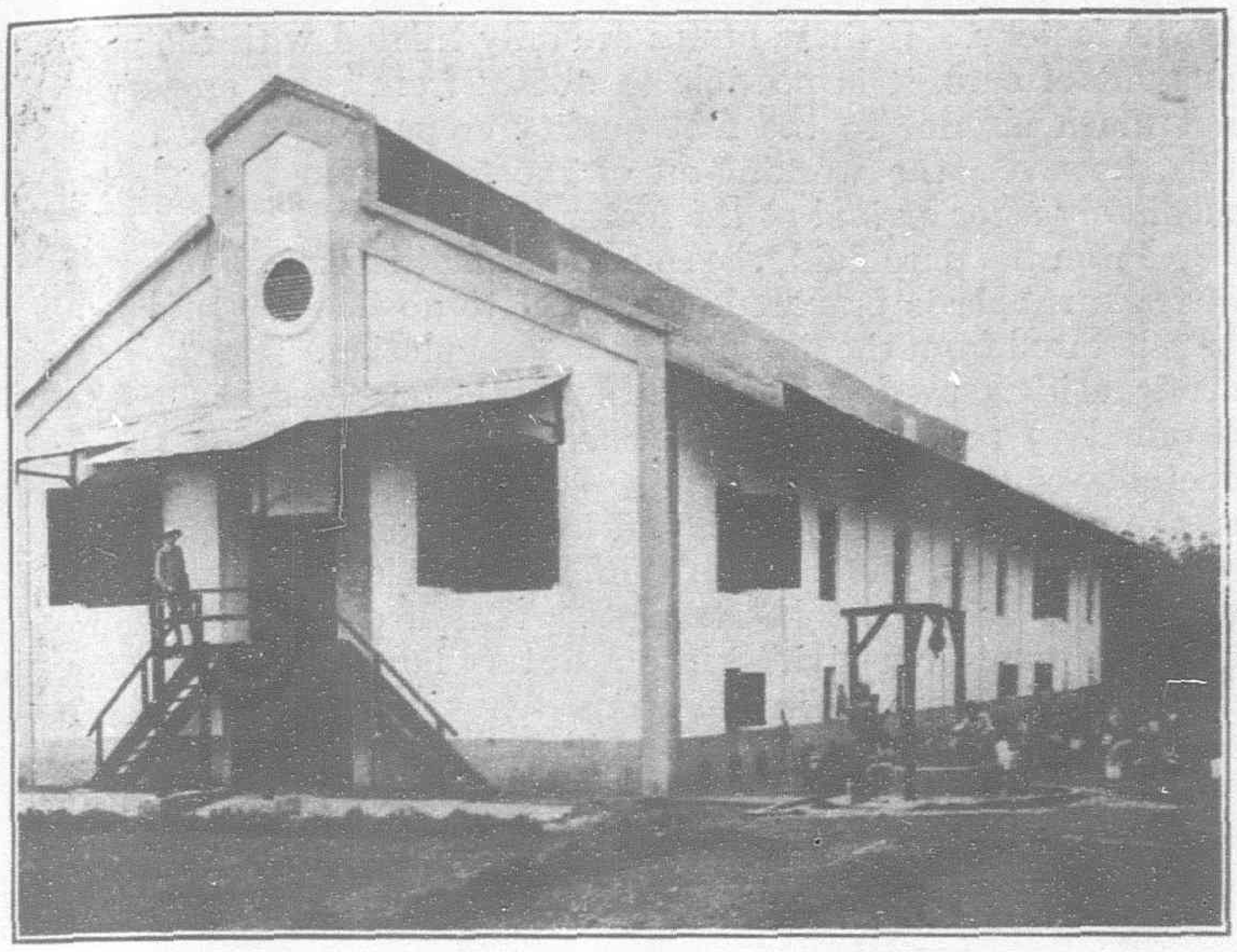
Rubber is planted both in Java and in the other islands of the Dutch East Indian archipelago (especially in Sumatra). As a rule, preference is given to flat, low lying land, but in Java we find plantations even as high as 2,000 feet above sea-level. At such a great altitude, the trees take longer to mature, but the growing of catch-crops is expected to counterbalance this disadvantage. For this purpose Robusta coffee, which can be cultivated without detriment to the main cultivation, and which comes into bearing about the third year after being planted, is usually chosen.

The department of agriculture in the Dutch East Indies has recently published the following figures showing the area planted with rubber, the production and the number of estates :—

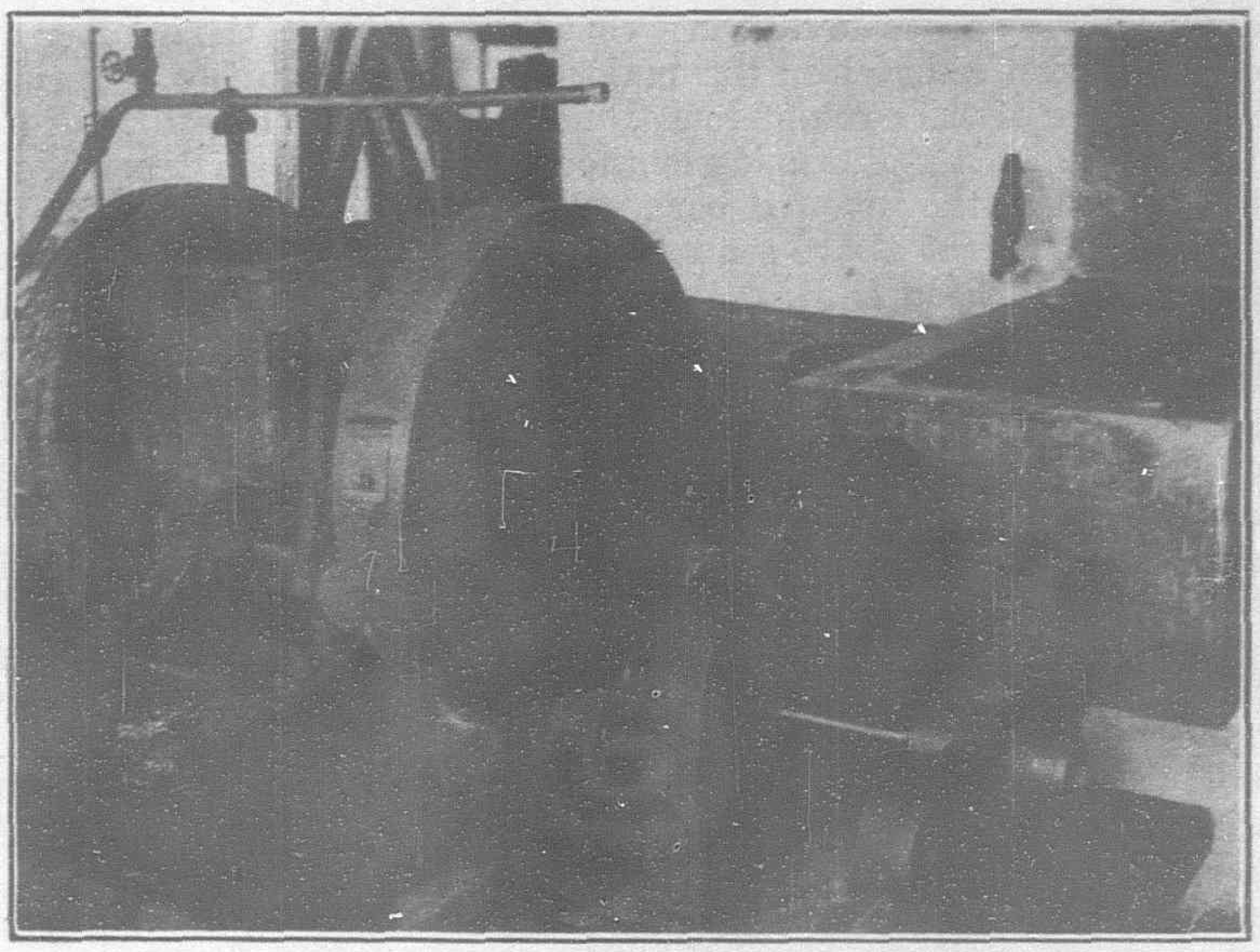
HEVEA BRASILIENSIS.

1920.	Total acreage. Hectares.	Production. Kilos.	No. of Estates.
Java ..	161,796	24,512,895	453
Other islands	201,486	37,427,853	452
Total	363,282	61,940,748	905
1920			
Java ..	157,949	27,258,245	451
Other islands	182,915	41,798,368	340
Total	340,864	69,056,613	791
Ficus elastica and other kinds of rubber.			
1920			
Java ..	4,658	33,791	—
Other islands	1,025	12,043	—
Total	5,683	45,834	—

For the growing of rubber, land is brought under cultivation in the usual way: clearings are made in the forest by felling and burning. Sometimes it is preferred to clear the soil completely of all tree stumps and dead wood for the reason that this method is the best preventative against the possible future appearance of the root moulds. After these preliminaries have been completed, holes are dug to receive the young plants. The seedlings are grown in nurseries where they remain for eight or nine months. By the end of this period they reached the thickness of about a finger and are transplanted to the plantation proper,



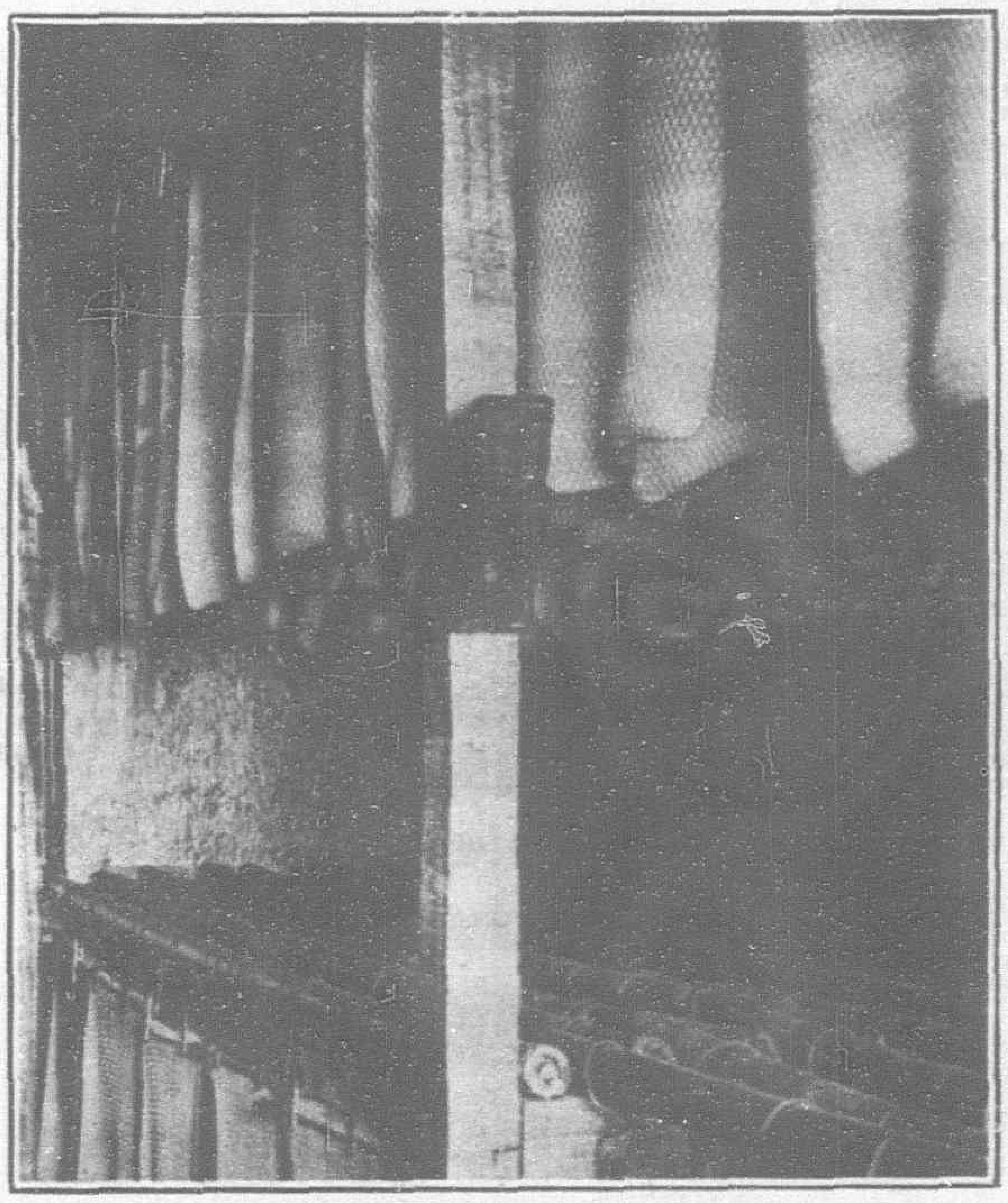
A Modern Smoke House on a Rubber Estate (East Java)



" Universal " washer used for the preparation of scrap, bark and earth rubber

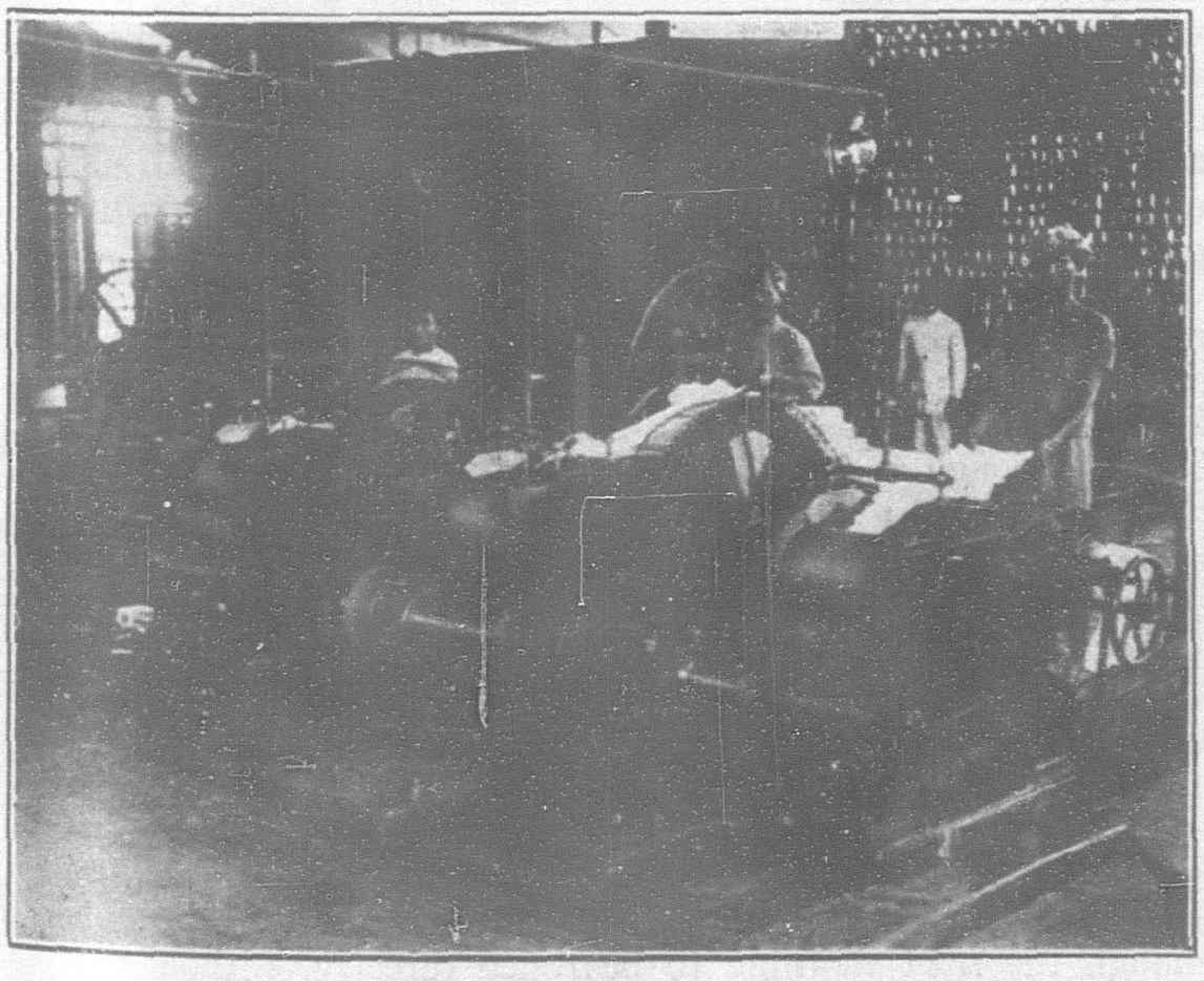
after they have been reduced to "stumps," i.e., after the tops and some of the finer roots have been cut off. Sometimes other methods of planting are persued. The seeds are then planted either directly into the gardens or in small baskets filled with earth. In the latter case, the seedlings are, at soon as they have sprouted, planted out basket and all.

The intervals at which trees are planted have greatly increased in the course of years. In old, densely planted gardens, thinning out occurs on nearly all the estates. In selecting the trees, the system is generally such that the trees with a small circumference are allowed to remain. On many other estates, however, the quantity of latex yielded by the different trees is taken as criterion. In thinning out, the planter often does not cut down the trees at once, but leaves them standing for half a year or even for one year, trying during that time to obtain from these trees as much latex as the can by tapping on two-quarters from two or more cuts. Sometimes the trees are cut at 6 to 8 feet, and the planter continues to tap the stem for some time.

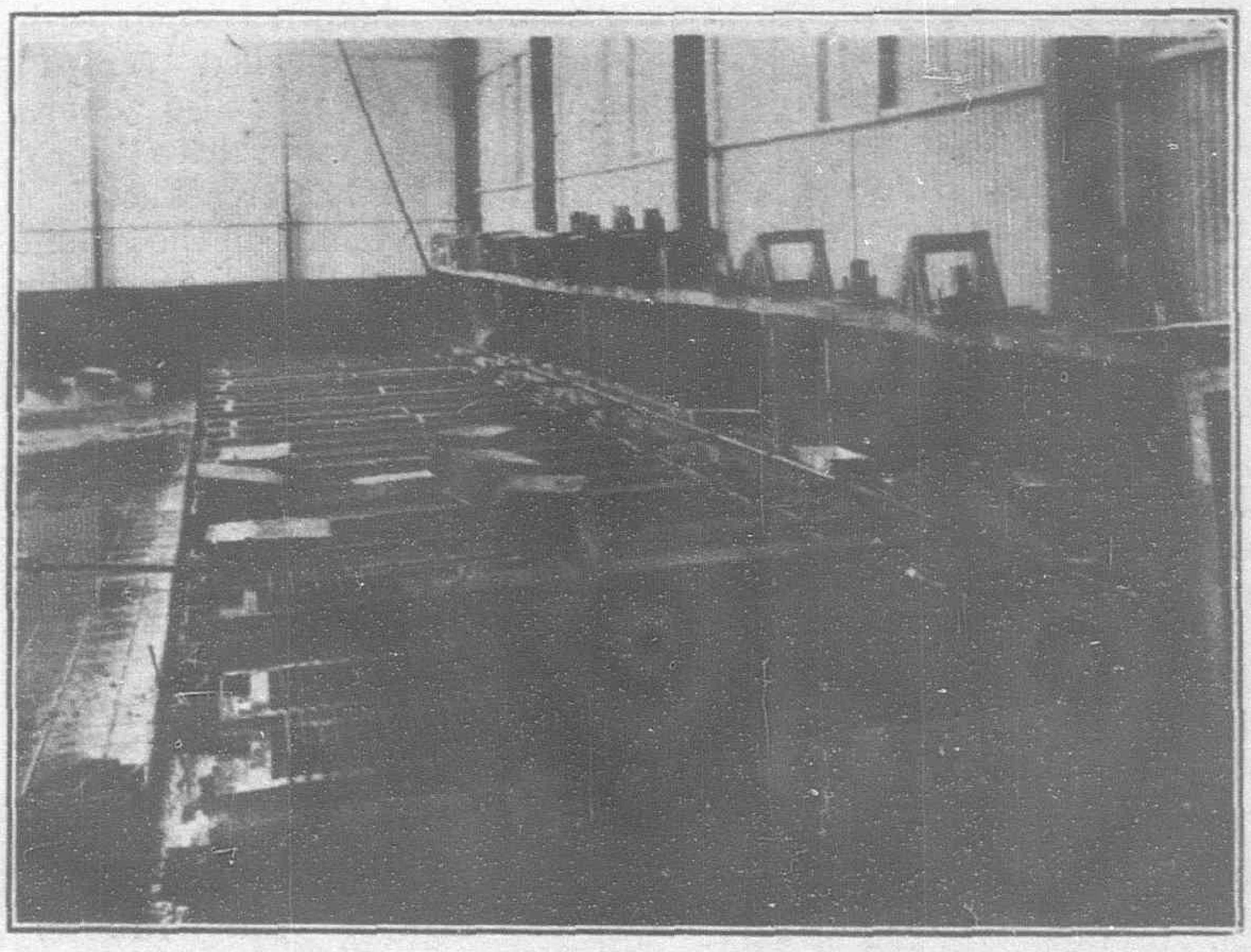


Sheet rubber hanging on bamboo poles in the a Smoke House

During the past decade there have been many tapping systems in operation, but in recent years methods have become far more conservative as regards severity of tapping. In selecting a system it is necessary to consider the financial side of the question and general health of the trees. The object aimed at in the former is to obtain the maximum yield of rubber at the minimum cost of production and in the latter to obtain the maximum amount of rubber with the minimum injury to the trees, and as conditions are quite different on many rubber estates, it is clear that not everywhere the same tapping system turns out to be the best and most profitable. Until some years ago, the so-called half-herringbone method was generally applied on one-third to one-fourth of the circumference of the stem, with four to six cuts, whereas on young trees the basal V, covering the half circumference, was applied. On other estates two-quarters were tapped



A battery of crepe rollers in a Java Rubber Factory



Tanks for the preparation of sheet rubber in Java daily or every other day. Since that time, however, the number of cuts has been reduced on the majority of estates to two, covering one-quarter of the circumference, and sometimes to one-third of it.

In the matter of tapping methods, of course, much depends on the growth of the renewed bark, which again depends on fertility of the soil, height above sea-level, and the condition in which the gardens have been kept.

The best time for tapping is the early morning when the latex flows more freely than later in the day. The latex which is exuded from the tapping cuts is guided by the main channel to the spout which conducts it to a receptacle (cup) of glass, aluminium or glazed earthenware. After the tappers have bled all the trees assigned to them, i.e., on the average 300 pro man, they collect the contents of the cups in enamelled pails, which are brought to the factory.

Since one of the first requirements in the rubber industry is the observance of the strictest cleanliness, this should be borne in mind from the moment that the latex flows out of the wounds. For, there is not the least doubt that one very unpleasant feature which sometimes affects prepared rubber, namely, the appearance of colored spots in the wet rubber, in many cases, owes its origin to infection of the latex in the fields. Great care should be taken therefore, that everything in the fields is carried out in a scrupulously clean manner, and particular care should be taken that the main conducting channel and the spout are clean before the tree is tapped. For the same reason, only such cups have to be used as can be easily and thoroughly cleaned.

Young Hevea rubber trees interplanted with Robusta coffee as catch crop (West Java)

The tappers go back to the gardens, from time to time, in the afternoons, after their other work is completed, with a bucket of clean water to wash the cups. Where it is the custom with trees which have not stopped flowing, to place the cup, afrte emptying, under the spout again, great caer is taken that such cups are particularly carefully cleaned the next morning before tapping is commenced, because the latex of the previous day has partially decomposed in the cups by the action of organisms, so that from this cause an infection of the new latex may be effected which, in the preparation of sheets can bring about the formation of the well-known air-bubbles. For the rest this is a fault in latex from old trees, when these are tapped too high, and in latex from trees which have, two or three months previously, wintered, i.e., thrown off their leaves.

A certain portion of the latex does not flow off from the stem, but remains behind in the tapping wounds where it coagulates in thin threads along the edges of the ducts. These so-called " scraps " are collected about noon. A small quantity of latex also adheres to the thin strips of bark removed by the tapping tool ; these " shavings " are also collected and subjected to further treatment. A further small quantity of latex drips from the wounds on the ground or is spilled from the cups by careless tappers, and coagulates where it falls. Even this spillage, the so-called " earth rubber " is collected and taken to the factory. The three grades, here described, are kept carefully apart during the process of curing.

When the pails containing latex have arrived at the factory they are there emptied into large tanks, in which the latex is allowed to stand for some time so as to permit of the sand and other heavy impurities settling before the liquid is passed through a coarse and afterwards through a fine sieve. The finest serviceable sieve for this work is one having 900-1000 meshes to the square inch. The straining must be done very carefully, especially if it is intended to make sheet rubber of the latex.

Already in the cups and in the pails the latex shows a tendency to coagulate. The lumps thus formed are taken out from the liquid latex and cured apart under the term of " lump rubber." This term also includes rubber which has coagulated prematurely at the factory. If these lumps are only treated with the necessary amount of care, it is possible to obtain from them crepe which is not much inferior to the first quality crepe. In order to achieve this, however, the working-off of the lumps must be started immediately after arrival at the factory.

From the pure fluid, the so-called " first latex," the best quality of trade rubber is prepared. In order to do this the rubber has to be separated from the liquid latex by coagulation. For this purpose acetic acid is used. The quantity and concentration of the acid required to produce complete coagulation, depend on the rubber contents of the latex which is to be coagulated. The thicker this is, the more acid is required, and the more diluted must it be. If, on the contrary, the latex is thin, less acid may be used, but the solution of acid must be stronger. Within one or two hours the latex has then been divided into a watery liquid and into soft white cake of rubber, possessing the consistency of cream cheese. If the color does not come up to the required standard of whiteness, a small quantity of sodium bisulphite or of a similar chemical is added as a bleaching agent.

Coagulation is effected either in large tanks, which are divided subsequently into partitions by means of frame work, orin small trays. The advantages of the tanks, which are becoming more and more used, especially in the case of large productions, are the saving in time and work which they effect, as well as the production of a more uniform rubber. They are made of cemented brickwork and the walls are lined with glazed tiles, or thick glass of exactly the same size as the surfaces to be covered. Care has been taken that the tiles fit closely together since the sheets are liable to adhere to the cement between the tiles. The partitions are, as a rule, made of aluminium or of wood which has been smoothly planed and which contains no coloring matter nor oil. Since, however, by long use of these wooden partitions the sheets are found to adhere to them, it is recommended to paint the wood with paraffin which has been liquified by heat.

It is of utmost importance that the acetic acid be evenly distributed throughout the latex. A large number of the faults exhibited by sheet rubber, may be traced to the fact that the acid and the latex were not well mixed together.

The coagulated cakes are taken out from their containing vessels next morning, care being taken that, in doing so, they are not doubled, or the edges curled over. Since the rubber is, in this stage, still very sticky, the cakes are laid down on tables which are covered with plates of thick glass. Here they are rolled out with a hand-roller. To ensure that sheets are rolled to the same thickness, use is made of a wooden frame or mould into which the sheet is placed.

After the sheets have been rolled out with the hand-roller, they may be placed one upon the other without detriment. In most cases they are placed into large bowls, e.g., Shanghai jars, which are filled with pure water, and here the sheets remain until they are to be put through the machines.

All this preliminary treatment of the sheets is sometimes omitted. And, indeed, it can with impunity be omitted, provided the coagulum tanks are so arranged that the serum can be run off in the afternoons.

After this has been done the cakes need only be swilled with water in order to free them of any remaining serum. This water must also, of course, be allowed to escape. The cakes are then left, dry, overnight, in the tanks. Owing to contraction of the rubber, much of the water which was closed up in the coagulum, is pressed out during the night, so that the cakes are quite hard enough the next morning to be rolled directly, without any preliminary treatment.

Large factories possess three or even four machines for rolling sheet rubber. Of these machines, two should have smooth rollers and there should be one or two printing machines. For the latter purpose, rollers with spiral grooves are coming more and more in favor. The spiral on each roller runs in the same direction and the pattern imprinted on the sheets somewhat resembles that made by a diamond mangle, but it is sharper, because the rollers of the diamond mangle are seldom set so truly that the ribs on one side of the sheet coincide exactly with those on the other side. Moreover, the sheets which are printed with the spiral-grooved mangles, appear to dry quicker.

In all the machines, the rollers must revolve at equal speed.

The rollers of one of the two smooth-rolled mangles are set wider apart than those of the other, whilst the rollers of the printing machine are still closer together.

In the case of small productions, one smooth-rolled and one printing machine has been found sufficient. All the sheets are first put through the smooth-rolled mangle, the distance between the rollers remaining constant. When the sheets have thus been mangled, the distance between the rollers is decreased and the sheets again put through. The diamond rollers remain always the same distance apart.

It is of great importance that all the sheets, after being mangled, are of the same thickness, because this has influence on the time required for drying them, and consequently on the speed with which they can be vulcanized.

Sheets of normal thickness are first put through the mangle once with the rollers wide apart, then once with the rollers closer together and, finally, once through the printing machine. Sheets which are too long, are previously cut into suitable lengths, though some people prefer to cut the sheets only after printing, thus reducing the number of processes through which the unfinished rubber has to pass, and thereby effecting a slight gain in time.

After the sheets have been passed through the machines, they are placed in clean water for some hours, or, better still, for a whole night, then brushed briskly and afterwards hung on racks to drip. This last process does not last more than two hours. Next the sheets are taken to the smoke-house and there hung up.

In order to prevent the sheets becoming unevenly smoked, they are to be shifted along the rods, from time to time, in such a manner that the same portion of the sheet does not always remain in contact with the support, otherwise, this portion will be lighter colored than the rest of the sheet.

The supporting rods from both the smoke and drying houses are regularly cleaned and washed with some disinfectant, and afterwards well dried.

The furnace or fireplace should be separated from the space in which the rubber sheets hang, by a fine grating which serves to keep back the ash particles or smuts which may be traveling along with the smoke.

The time requisite for the complete drying of the sheets varies, of course, with the temperature, the system of the smoke-house and with the degree of moisture in the atmosphere of the particular estate. A sheet of 3 millimetre thickness will be dry in eight to ten days if the temperature of 40 to 50 degrees Celsius, which is considered best, is maintained.

The sheets remain in the smoke-house, even after they are completely dry, for a few days.

For the manufacture of crepe rubber, it is customary to use a stronger solution of acetic acid in coagulating the latex than is used for sheet rubber, namely a 5 per cent. solution, although many factories prefer to work with a weaker solution. The latex and acid are thoroughly well mixed together with a broad wooden spoon or ladle. In most factories it is customary to allow the coagulated latex to stand until the next morning before starting to work it off on the machines.

For the manufacture of crepe, at least three different machines are required, viz., a crepe machine, the rollers of which are deeply grooved (preferably diamond or spiral pattern), a machine with shallow-grooved rollers, and a machine with smooth rollers. In all these machines the rollers revolve at uneven speeds. There is, as yet, much diversity of opinion regarding to the amount of difference which should exist between the speeds of the rollers. Some prefer only a slight difference in these speeds, viz., 5 : 6 ; whilst tohers advocate a great difference, i.e., 2 : 3; the latter class of people argues that the smooth rolled machine should work with the same difference in relative speeds as does the crepe machine. The object of this is that the small holes in the crepe may be quicker and more satisfactorily filled up. Those who prefer a small difference in the speeds of the rollers, usually carry out the crepeing operations in the following way :—

Equal quantities of rubber are put first five to six times through the deep-grooved machine, then twice or three times through the machine with shallower grooves, and finally once or twice through the smooth rollers. When four machines are in use, the rubber is put respectively 3, 2, 2, and 1 times through. If there are too many holes in the crepe, the piece is doubled and put so through the machine. It is usual, when the crepe is going for the last time through the machine, to put it through unfolded.

During its passage through the rollers, the rubber is continually cooled with water, otherwise there is the possibility that the quality will suffer and that the finished rubber will appear to be " tacky."

When the crepe has finally left the machines, it is cut into pieces of suitable dimensions. This is done by placing upon the crepe a board, having the required form and size. Then with a sharp knife, the crepe is cut to the shape of the board. The clippings or trimmings are again worked into crepe on the machines. The coolies in charge of the machines, however, soon learn, with practice, to roll the crepe so regularly that no trimming will be necessary.

The pieces of crepe are allowed to drip for a time and are then brought to the drying house.

Crepe rubber is usually air-dried, though there is no reason why it should not be dried by artificial heat provided it is not subjected to a greater heat than 40 degrees Celsius.

The drying house is well ventilated so that the moisture-ladey air can easily escape. The necessity for drying the crepe quickln arises from the fact that so long as it remains wet, it provides an excellent feeding ground for moulds and bacteria which cause colored spots to appear on the finished rubber and give it, therefore, a less attractive appearance. These organisms are not able to develop on dry rubber.

Under normal circumstances, crepe of 2 millimetres thickness is dry in about seven days.

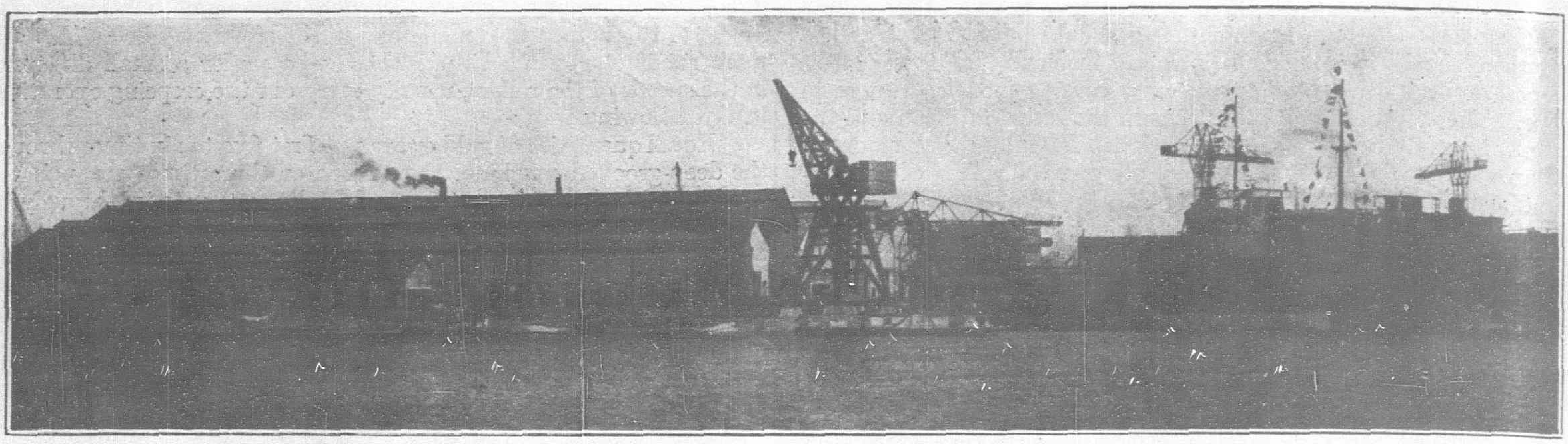
Both crepe and sheet rubber are packed in the cases only when perfectly dry, otherwise there is the danger that the rubber will mould in course of transport or that, on arrival at the market, it would cleave so tightly together that it would be impossible to separate the pieces from each other. For the same reason the cases are stored in a dry place, and in no case they are put down on cement or earthen floors.

In Java, where labor is cheap and plentiful, the cost of production is very low, and with rubber selling at only 9 or 10 pence a pound f.o.b. Batavia, there is little distress. On the east coast of Sumatra the estates are almost entirely first class and are controlled by properly financed companies. They are faced with a higher cost of production than in Java, because here, as in British Malaya, coolies have to be imported, and recruiting expenses are very heavy. This factor has prevented many estates from closing down under the unfavorable market situation during 1921-22.

The following table shows the quantities of rubber exported from Java and the other islands of the Dutch East Indian archipelago during recent years. The figures show how great is the significance of the industry for the world's rubber market :—

Year.	Exports from Java. Metr. tons.	Exports from other islands. Metr. tons.	Total exports. Metr. tons.
1914	3,811	6,475	10,286
1915	7,509	12,380	19,889
1916	13,944	19,672	33,616
1917	18,843	26,775	45,618
1918	17,311	26,739	44,050
1918	35,263	54,460	89,723
1920	31,190	59,101	90,291
1921	29,350	44,051	73,401
1922	31,659	72,368	104,027

It will be noticed that the exports of rubber from the Dutch East Indies have increased tenfold in these nine years. The industry, therefore, holds a position of paramount importance. That financiers are confident of the future of this industry is proved by the large amount of foreign capital which it has attracted.

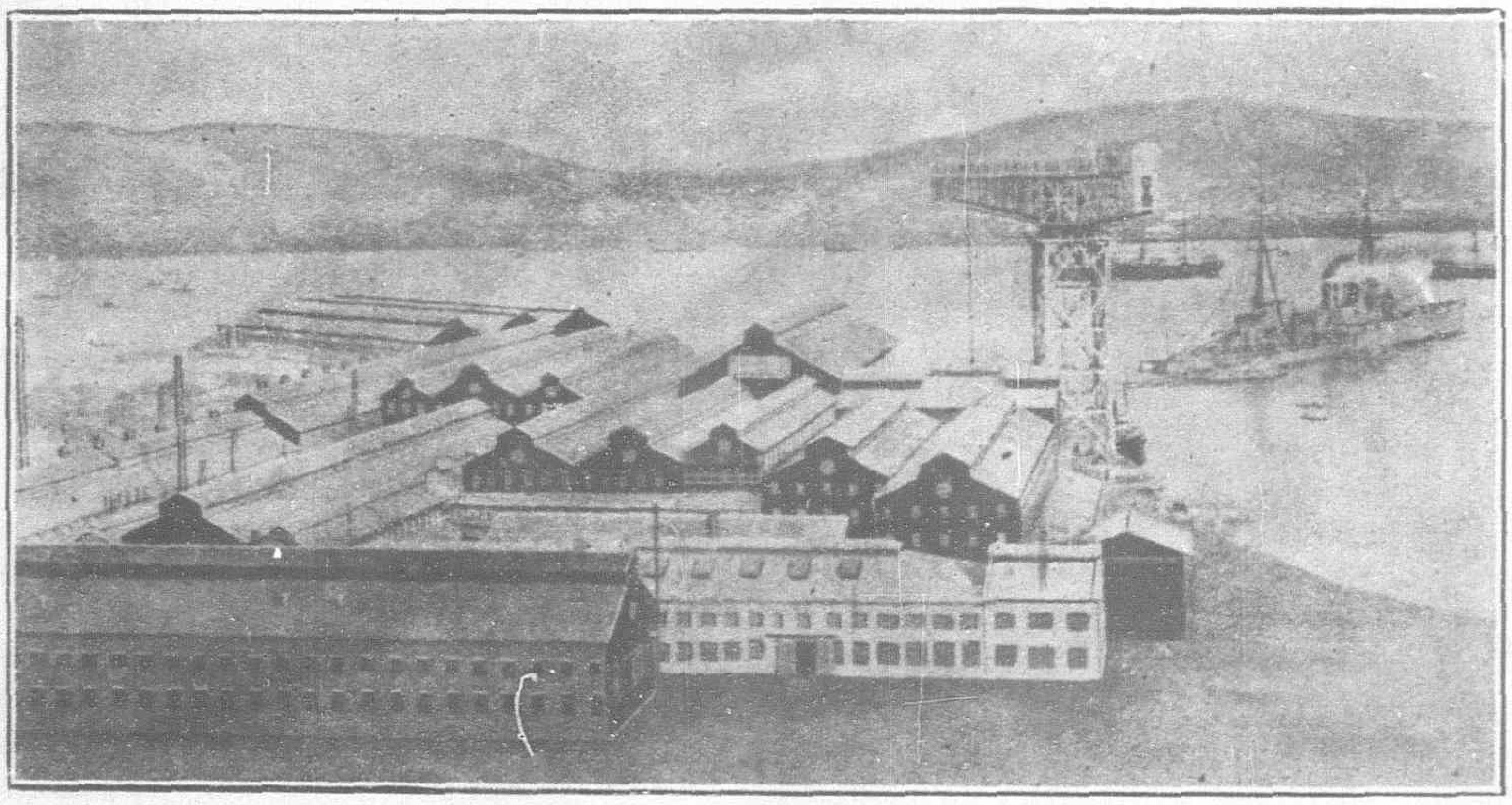


The Ishikawajima Shipyard at Tokyo, one of the oldest and best known Japanese Builders of Machinery

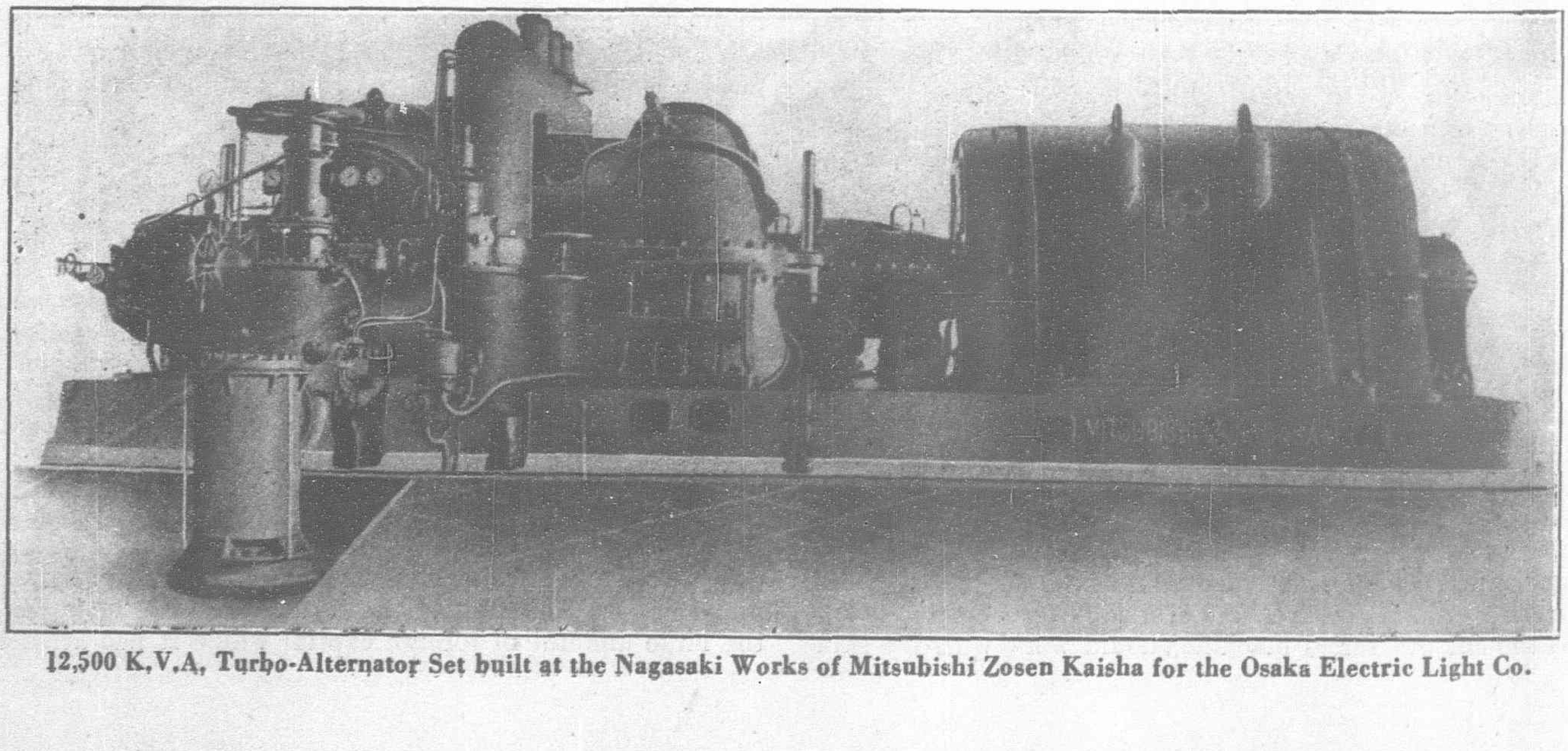
Machinery Manufacture in Japan

THE development of the engineering industries in Japan has reached the point where an association of 300 member firms have recently requested the government for tariff protection against foreign competition. Many of these machinery manufacturers are turning out motors and engineering products which can no longer be decried as imitations of foreign patterns. The Japanese engineer has kept abreast of the times and although it is true he has visited all countries seeking ideas and a knowledge of up-to-date methods, he does not adopt them all by any means. As Mr. Elmer A. Sperry, the head of the Sperry Gyroscope Company recently said "Japan is not a nation of copyists. The Japanese think for themselves with quicker mental reactions than the Anglo-Saxons. Their methods of construction are the latest and in some cases more advanced than in America. For every idea they adopt from America they reject a hundred."

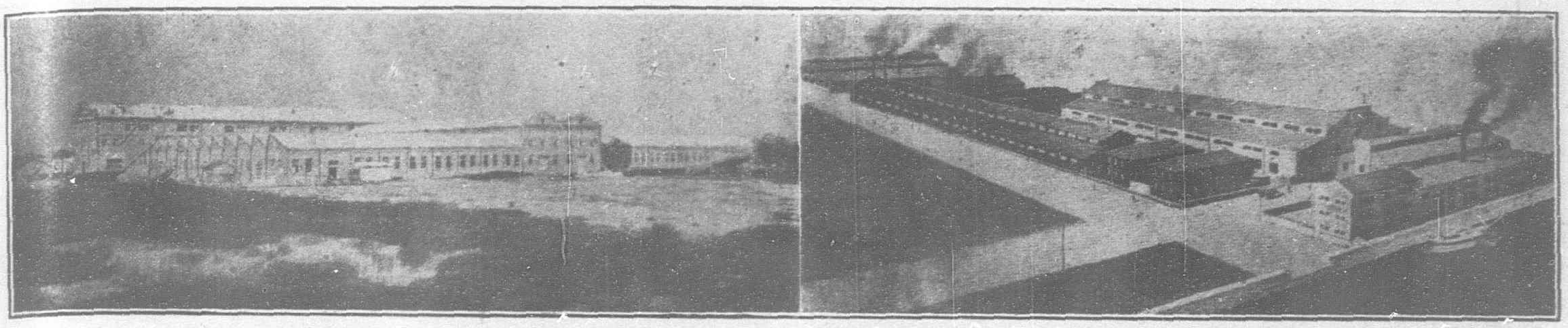
That this is true is seen in the many types of prime movers, steam, gas and oil engines, steam generators, turbines, large gas engines, and especially in the electrical machinery and accessories, now being manufactured in Japanese-owned plants by Japanese workmen under Japanese supervision. All this is of comparative recent growth, for although remarkable progress was made in the engineering industries in the latter part of the last century, it was not until the Russo-Japanese war that real advances marked the growth of the industry. The manufacture of modern machinery in Japan dates from the seventies, and at the industrial exhibition held in Tokyo in 1877, the Ishikawajima Shipbuilding Company exhibited a marine steam engine and the Tokyo Electric Company a gas engine completely built at their respective works. Both were extremely crude as measured by the standards even of those days, but they indicated that private enterprise was even then attempting to develop the manufacture of prime movers. After the war



Machinery Department of the Nagasaki Works of the Mitsubishi Zosen Kaisha



12,500 K.V.A. Turbo-Alternator Set built at the Nagasaki Works of Mitsubishi Zosen Kaisha for the Osaka Electric Light Co.



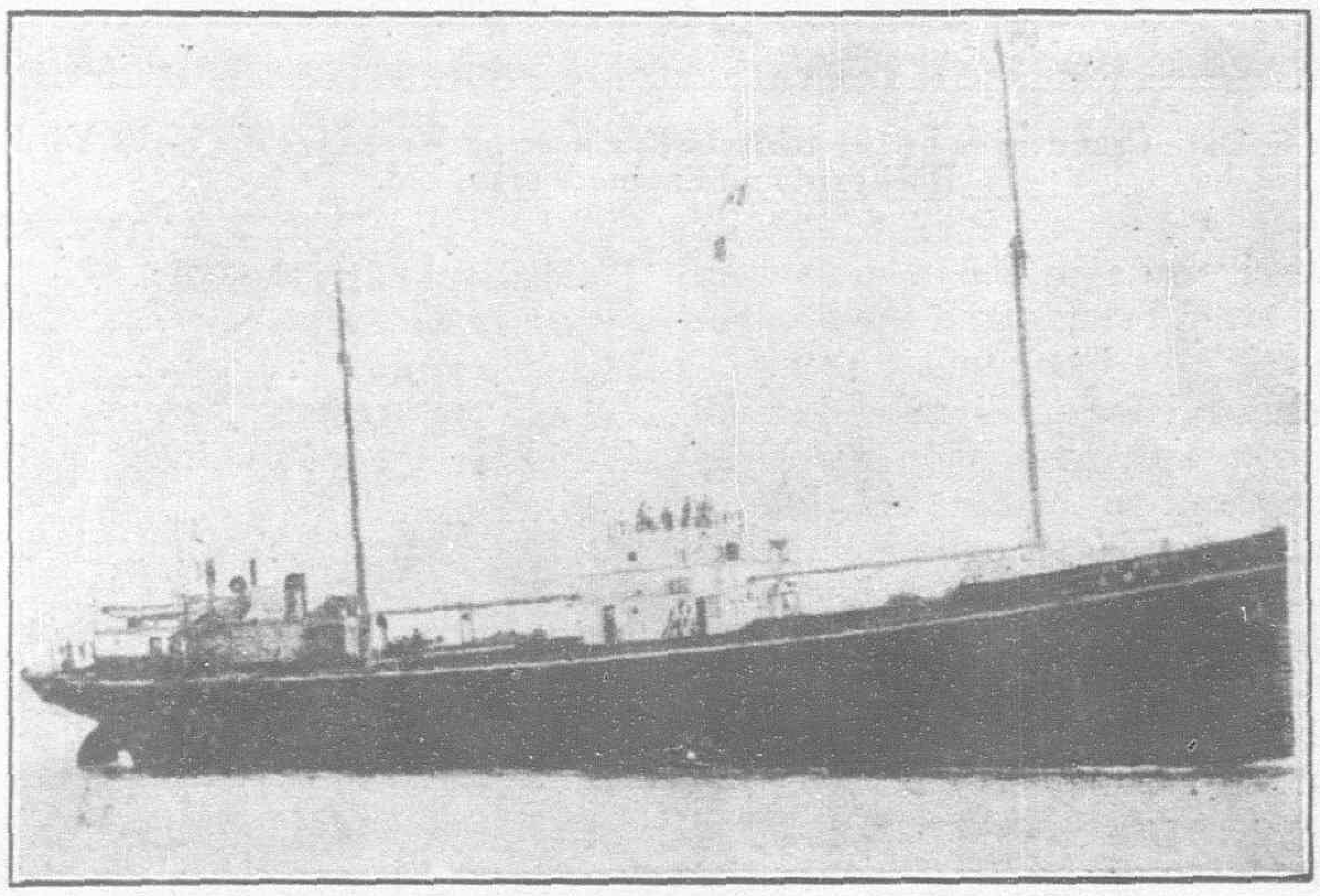
THE NIIGATA ENGINEERING WORKS

The New Diesel Engine Works at Kamata

The New Tokyo Works

with China, the regulation for the encouragement of the shipbuilding industry providing a bonus of Y.5 per horse-power for each prime mover manufactured in the country, stimulated the shipyards to manufacture steam engines and encouraged the establishment of many new power machinery manufacturers. Among these were the Hatsudoki Seizo and the Arakawa Seisaku companies organized in January 1902 and the Dengyosha Gendoki Seizosho in 1910. In addition to these three, there existed at the outbreak of the great war the Nagasaki and the Kobe yards and shops of the Mitsubishi Shipbuilding Company, the Kawasaki Dockyard, the Kameido Works of the Hitachi Engineering Works, Ltd., one of the Kuhara enterprises, and the Ebara Siesakujo both established in 1912. The largest work turned out by any of these shops was water turbines of 1,000 horse-power, and steam engines under 1,000 horse-power. Gas engines of 300 to 400 h.p. were then the limit, the total production of all the works in Japan in 1913 being estimated at Y.100,000 in water turbines and Y.6,000,000 in steam generators and engines of all kinds.

As in the case of the two previous wars, by cutting off importations the great war forced the establishment of many new machinery manufacturers and great extensions to the then existing plants, so that by the end of 1921 there were 124 concerns manufacturing power machinery, including those making pumps and cranes. Of this total, the number making steam engines, boilers and pumping machinery was about 75, with 45 devoted to the manufacture of internal combustion engines. There were also several plants exclusively engaged in the manufacture of water turbines and cranes. Before the war the total number of workmen engaged in the industry was only 988, while at the end of 1919, there were 13,000, by but the end of 1920 the number had fallen to 10,000.



Motor Ship "Jiro Maru," propelled by a 4-cylinder 360 H.P. Niigata Marine Oil Engine

The following list gives the names of the leading power machinery manufacturers, products and number of workmen employed at the end of 1920 :—

Japanese Power Motor Manufacturers 1920.

Name	Manufactures	Number of Workmen
Nagasaki Shipbuilding Yard of Mitsubishi Co.	Marine boilers, steam engines, water turbines, pumps, etc.	*13,500
Kobe Shipbuilding Yard of Mitsubishi Co.	same	6,800
Kawasaki Dockyard	same, and Diesel engines	12,000
Hyogo branch of the Kawasaki Dockayrd	Motors for aeroplanes	6,703
Kameido Works of the Hitachi Engineering Co.	Water turbines, steam engines and boilers, pumps, cranes, etc.	644
Kamata Works of the Niigata Iron Works	Diesel engines, kerosene motors	500
Hatsudoki Mfg., Co., Ltd. ...	Suction gas engines, oil engines	526
Honshiba Workshop of the Ikegai Iron Works	Diesel engines, kerosene engines, motors for aeroplanes	280
Name	**Manufacturers**	**Number of Workmen**
Mitsubishi Internal Combustion Engine Mfg. Co., Ltd. ...	Diesel engines	749
Kobe Steel Works	Diesel engines, boilers, steam engines, pumps	2,024
Dengyosha Gendoki Mfg. Co. ...	Water turbines, Pelton water wheels	650
Arakawa Engineering Works ...	Water turbines, pumps, cranes	500
Ebara Engineering Works ...	Centrifugal pumps, water turbines	90

(* includes employees in other lines).

The production value of the Japanese power machinery manufacturers for 1914, 1919 and 1920 follows :

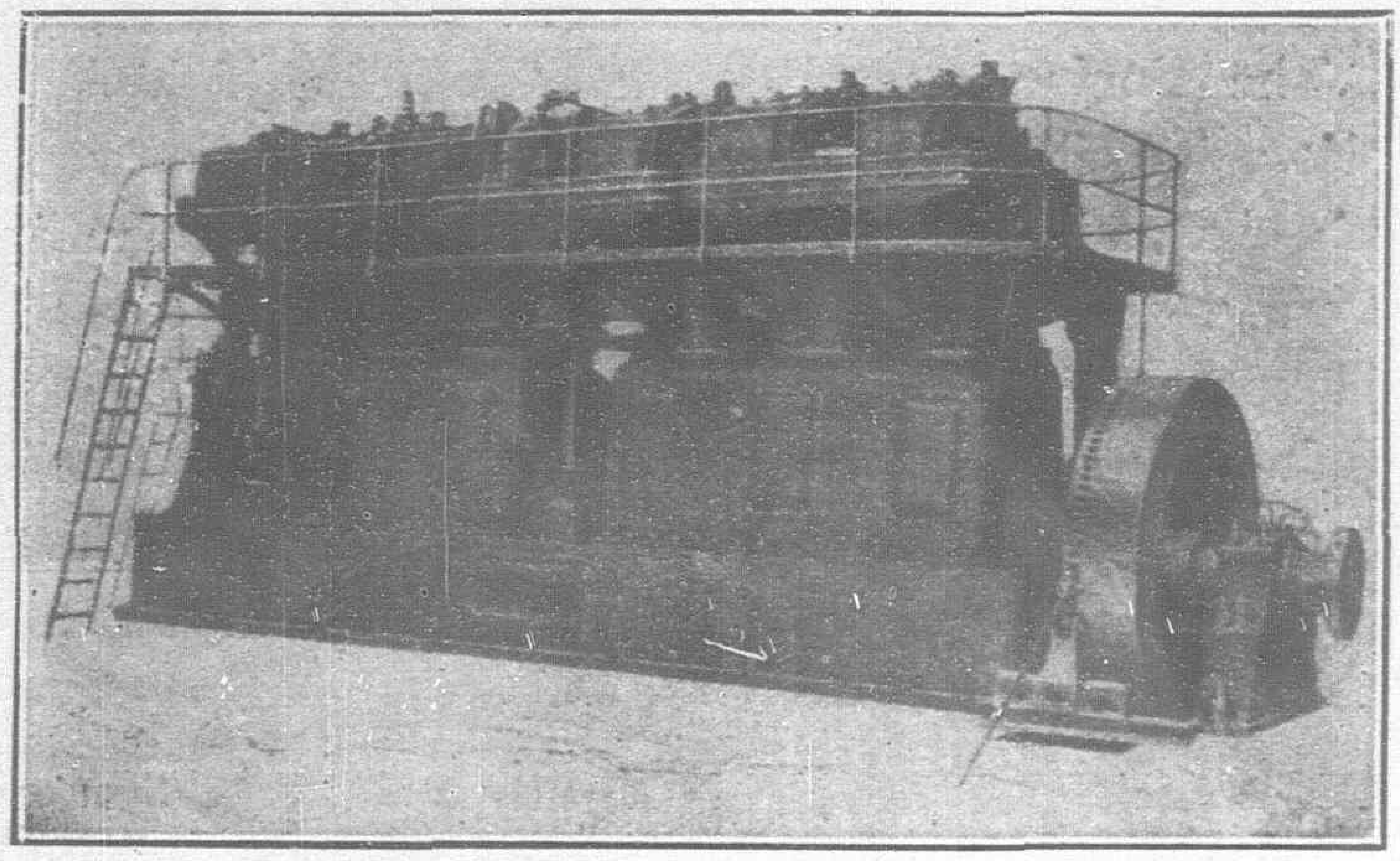
Type Equipment	1914	1919	1920
Boilers, steam turbines ..	Y.5,000,000	Y.24,000,000	Y.13,000,000
Steam engines	1,000,000	14,000,000	5,700,000
Pumps and blowers ..	1,000,000	6,000,000	6,500,000
Internal combustion engines	1,000,000	8,000,000	8,000,000
Water wheels	1,000,000	2,400,000	4,500,000

With the installation of modern tools and education of the mechanics the products became more and more finished, comparing favorably with the best importations from abroad.

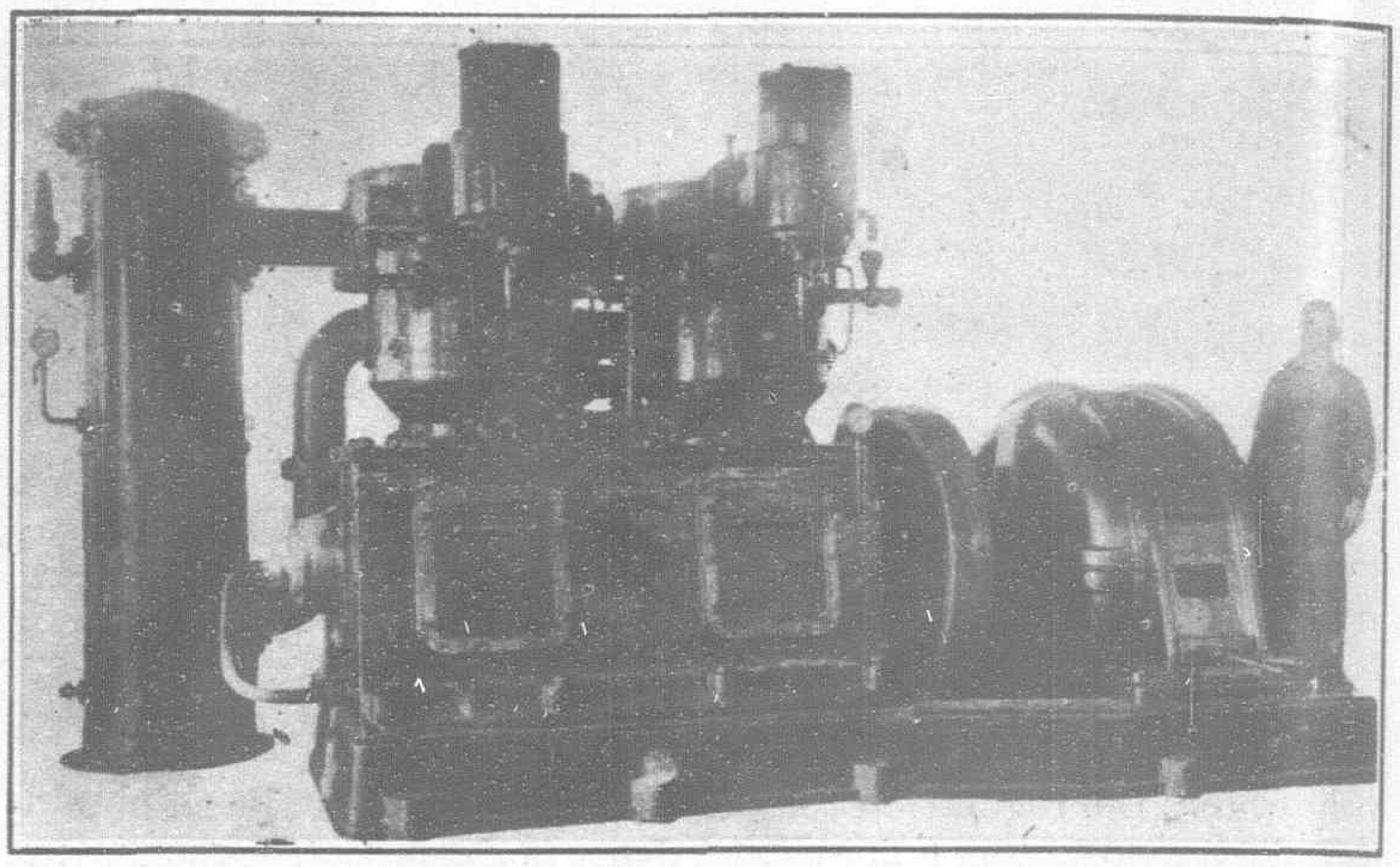
In the matter of steam generators, including high pressure water-tube boilers of large capacity for battle-ships, the Kwasaki and Mitsubishi yards have been able to fully meet the severe tests and requirements of the navy department and supply its needs. The Kisha Seizo Company has also entered this field with a 600 h.p. Takuma water-tube boiler. Vertical, cylinder and multitubular boilers are produced in all sorts of small shops to an extent that they fully meet the domestic demand. The Mitsubishi and Kawasaki companies were also enabled to make large capacity steam turbines for the Japanese navy with complete success, while at the Nagasaki Works of the former company, steam turbo-generating sets of 12,500 k.v.a. have been built for the Osaka, Tsingtau, and other large electric lighting plants. A start was also made in the manufacture of gas engines of 500 h.p. and over.

The same progress has been made in the manufacture of Diesel engines and we find the Mitsubishi Internal Combustion Engine Company holding the manufacturing rights of the Vickers patents, the Kawasaki Dockyard the Fiat rights, the Kobe Steel Works with the Lungstrum and the Niigata Iron Works with Mirrlees, Bickerton & Day patents. The first three companies have supplied the Japanese navy with large type engines of 600 to 1,000 h.p., while the Niigata Iron Works is engaged principally in the manufacture of small and medium sized marine motors.

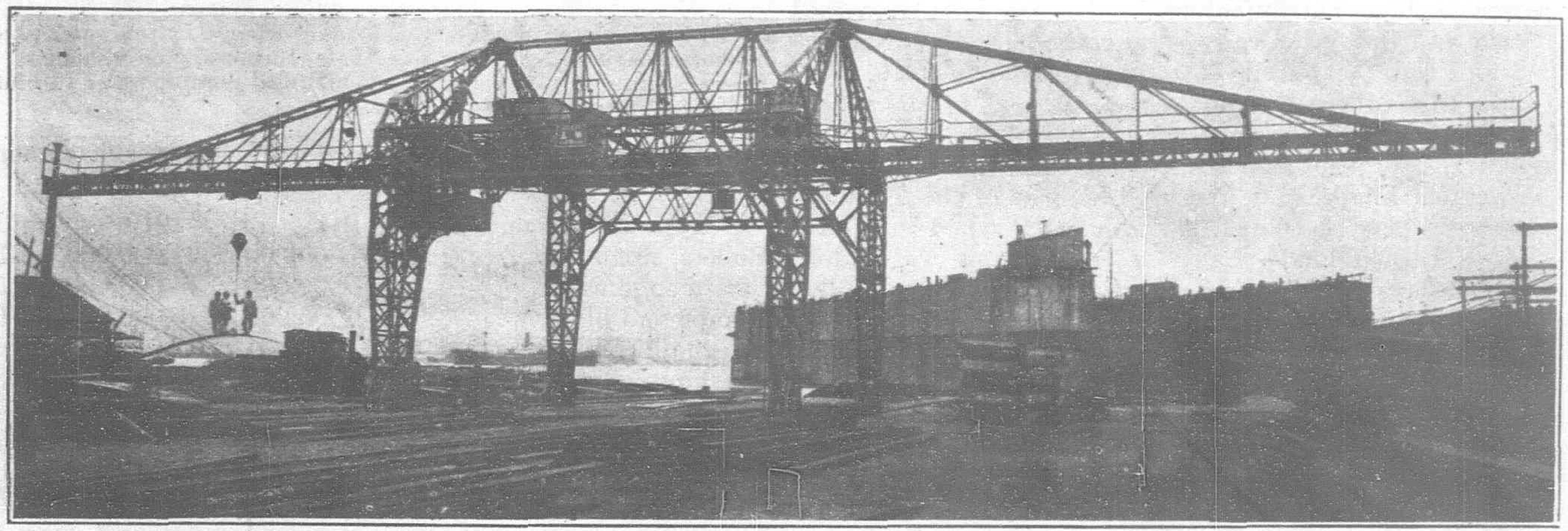
Towards the end of 1917, a perfect water turbine with a capacity of 31,000 h.p. was produced ; since then, many 6,000 to 7,000 h.p. and even 10,000 h.p. water turbines have been made in Japan, while the production of governors and pressure regulators has reached a point where they can stand comparison with foreign manufac-



A 750 B.H.P. "Niigata-Diesel" Engine. Built at the Kamata Works



250 H.P. Vertical Air Compressor made by the Hidachi Engineering Works for the Saseho Naval Station



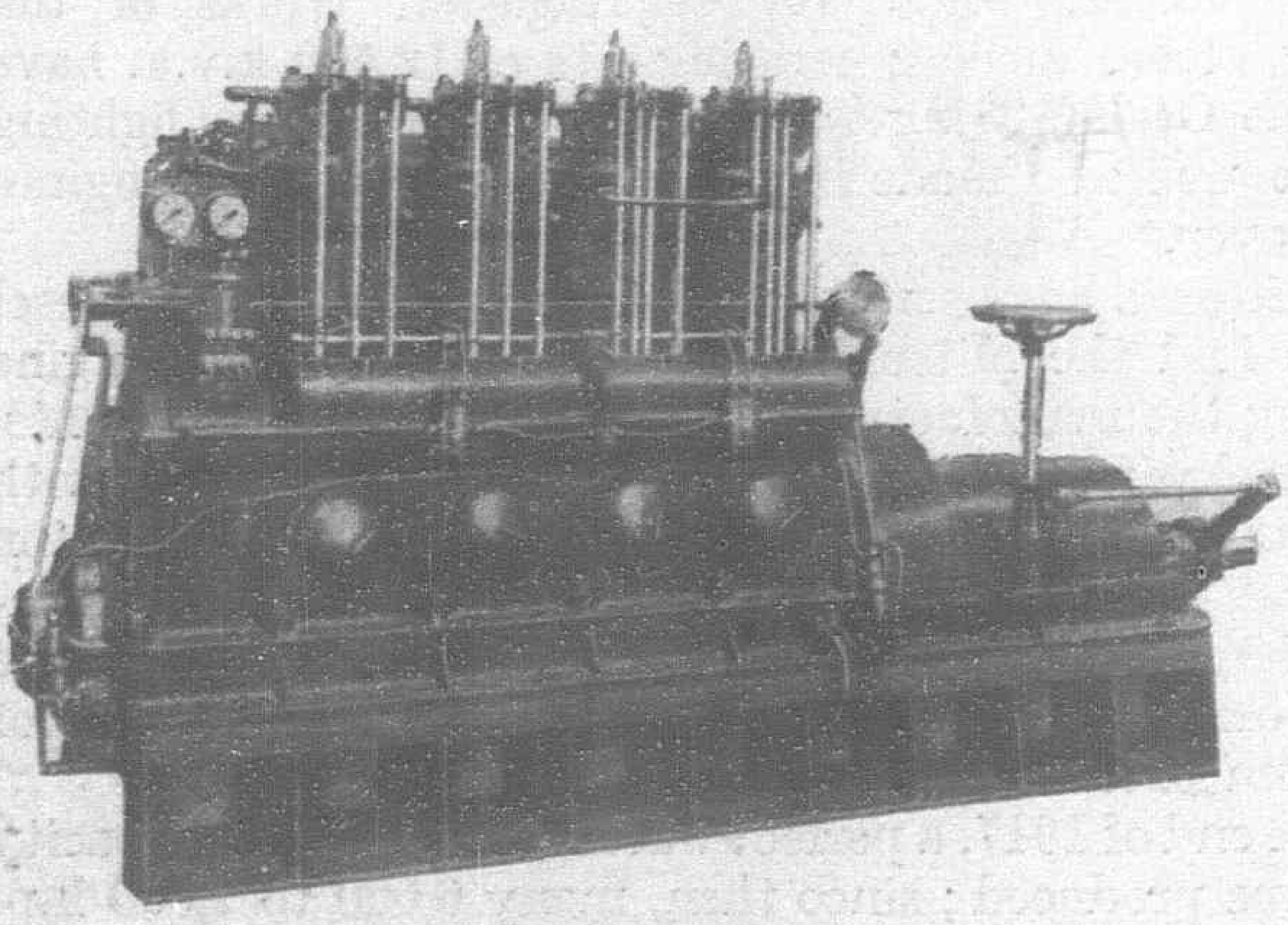
Fire Ton Cantilever Goliath Crane made by the Hidachi Engineering Works for the Kobe Yards of the Mitsubishi Dockyard and Engine Works, Ltd.

tures. Great progress has also been made in the manufacture of centrifugal and turbine pumps of several stages and the production of centrifugal pumps feed water is now being undertaken.

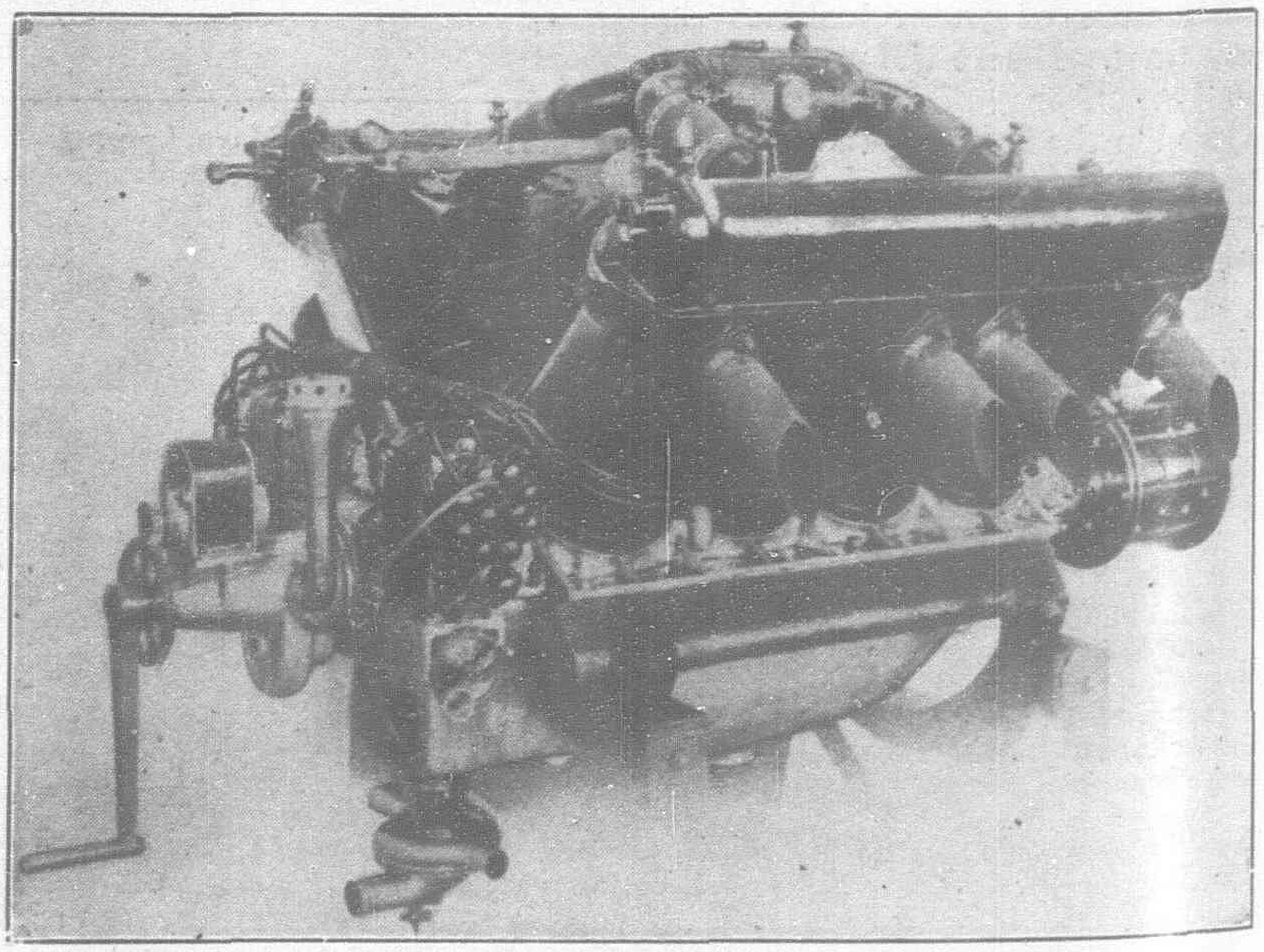
Practically all the domestic demand for medium and small size power machinery can be met by home-made machines to-day. The rapid industrial development as the result of the war has compelled machinery buyers to insist on better equipment, with the result that the Japanese manufacturers have been forced to improve their methods and the quality of their products. Notwithstanding these general improvements all along the line in the Japanese engineering industries, it is still difficult for the Japanese manufacturer to produce high power steam turbines, gas engines, water-tube boilers and other plant, of high efficiency and complicated structure. These have largely been imported from other countries, as shown in the following table of imports of foreign machinery in recent years :—

	1914	1920	1921
Boilers and parts thereof . .	Y. 945,000	Y.7,294,000	Y.9,116,000
Steam turbines . .	163,000	1,702,000	2,292,000
Steam engines	453,000	492,000	391,000
Oil and gas engines . .	366,000	4,771,000	1,111,000
Water turbines of all kinds	322,000	779,000	1,600,000
Total . .	Y.2,249,000	Y.15,036,000	Y.14,511,000

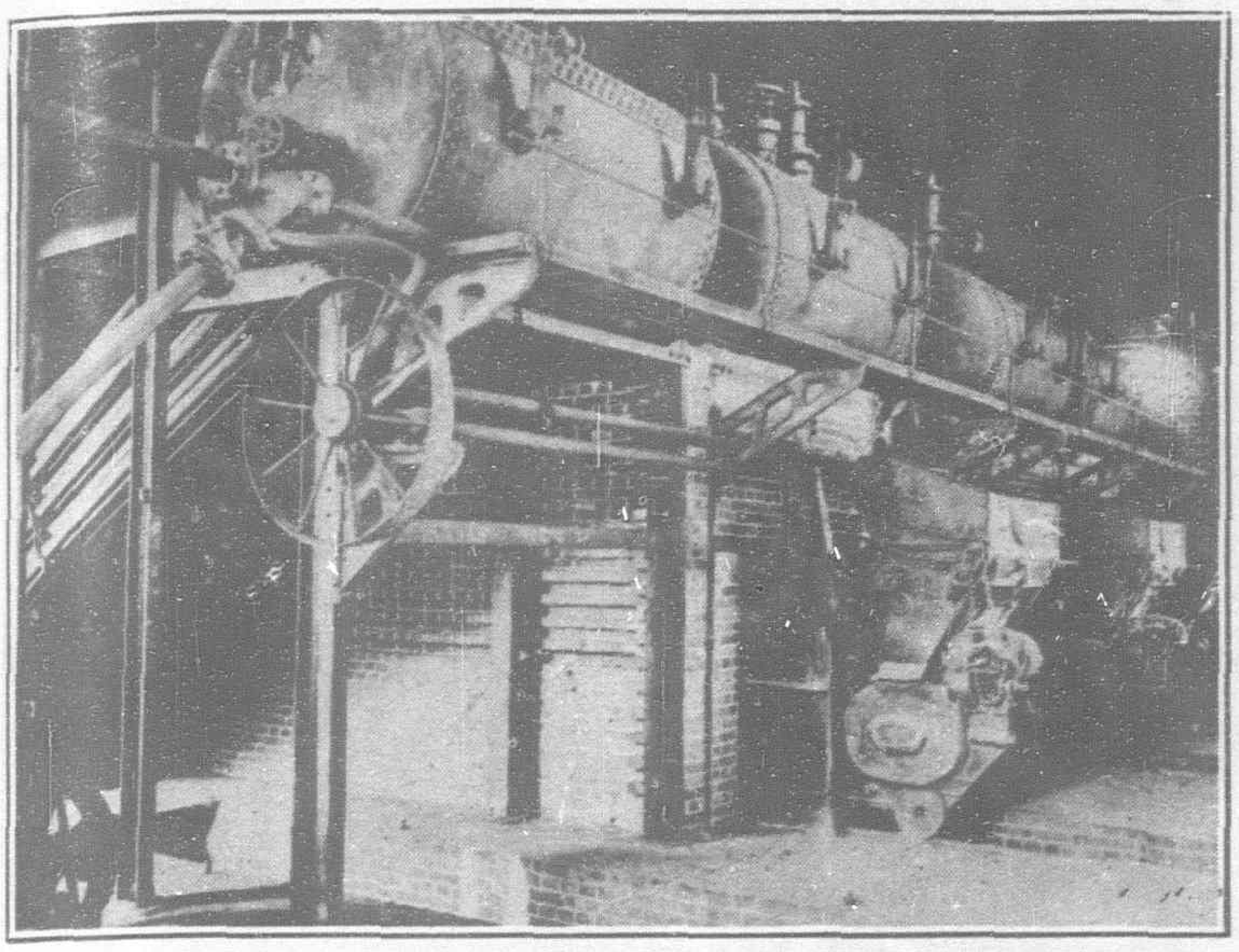
Imports of steam engines are not particularly active, as the Japanese shops can now compete with the best foreign makers, and in recent years have built up a considerable export trade as the table on next page shows.



100 B.H.P. Marine Diesel Engine built by the Ikegai Iron Works



300 H.P. Mitsubishi ("Hispano-Suiza") Aero-Motor made to the Nagoya Works of the Mitsubishi Internal Combustion Engine Co., Ltd.



Takuma Water Tube Boilers with Automatic Stokers made by the Kisha Seizo Kaisha, Osaka Works

EXPORTS OF STEAM ENGINES, PUMPS AND CRANES.

	Boilers and parts	Pumps	Cranes
1917	Y.514,000	—	—
1918	698,316	—	—
1919	1,175,258	Y.378,508	—
1920	371,470	293,756	—
1921	591,158	297,261	Y.114,201

An investigation made at the end of 1920 disclosed that about 82 per cent. of the boilers installed in mines, factories and other industrial establishments in Japan were of domestic manufacture. Water-tube boilers are, however, practically all of foreign make.

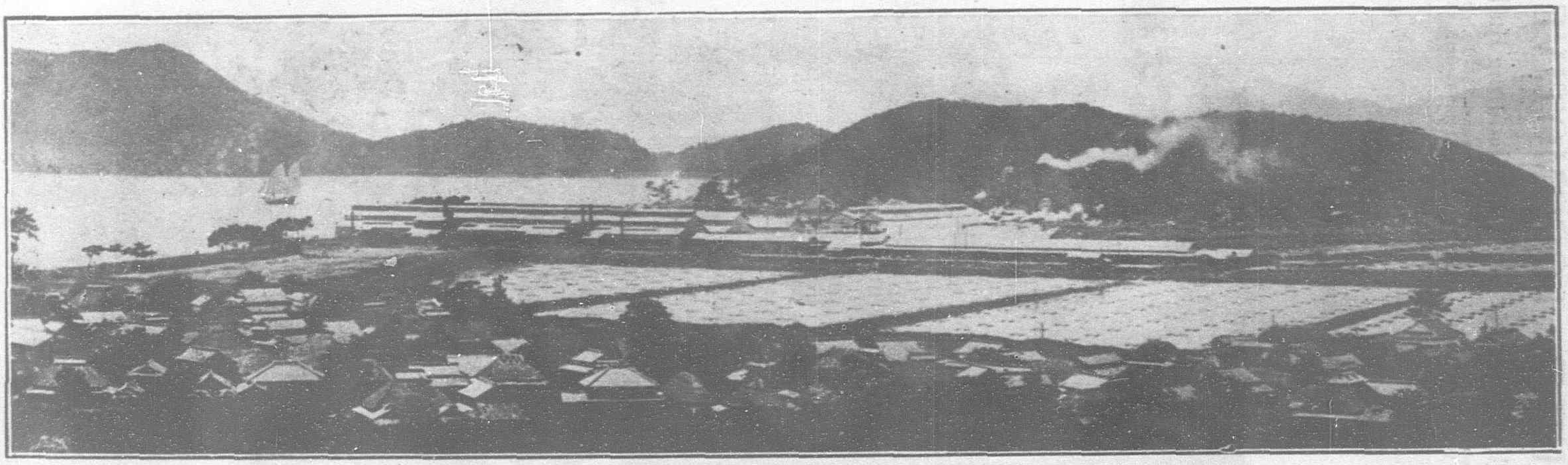
Japan is naturally handicapped in the manufacture of power machinery, by the lack of raw materials which must be imported. Here workmen are not as highly skilled or efficient as those of older manufacturing countries, and any great development of the industry is going to be difficult until her mechanics as a class are better trained in the use of modern automatic and labor-saving devices. The demand for Japanese machinery has recently shown a remarkable decrease, causing such concern to the manufacturers that they have asked the government for protection. The following table shows the percentage of domestic and foreign boilers installed in Japanese industrial works :—

INSTALLATION OF BOILERS IN JAPAN

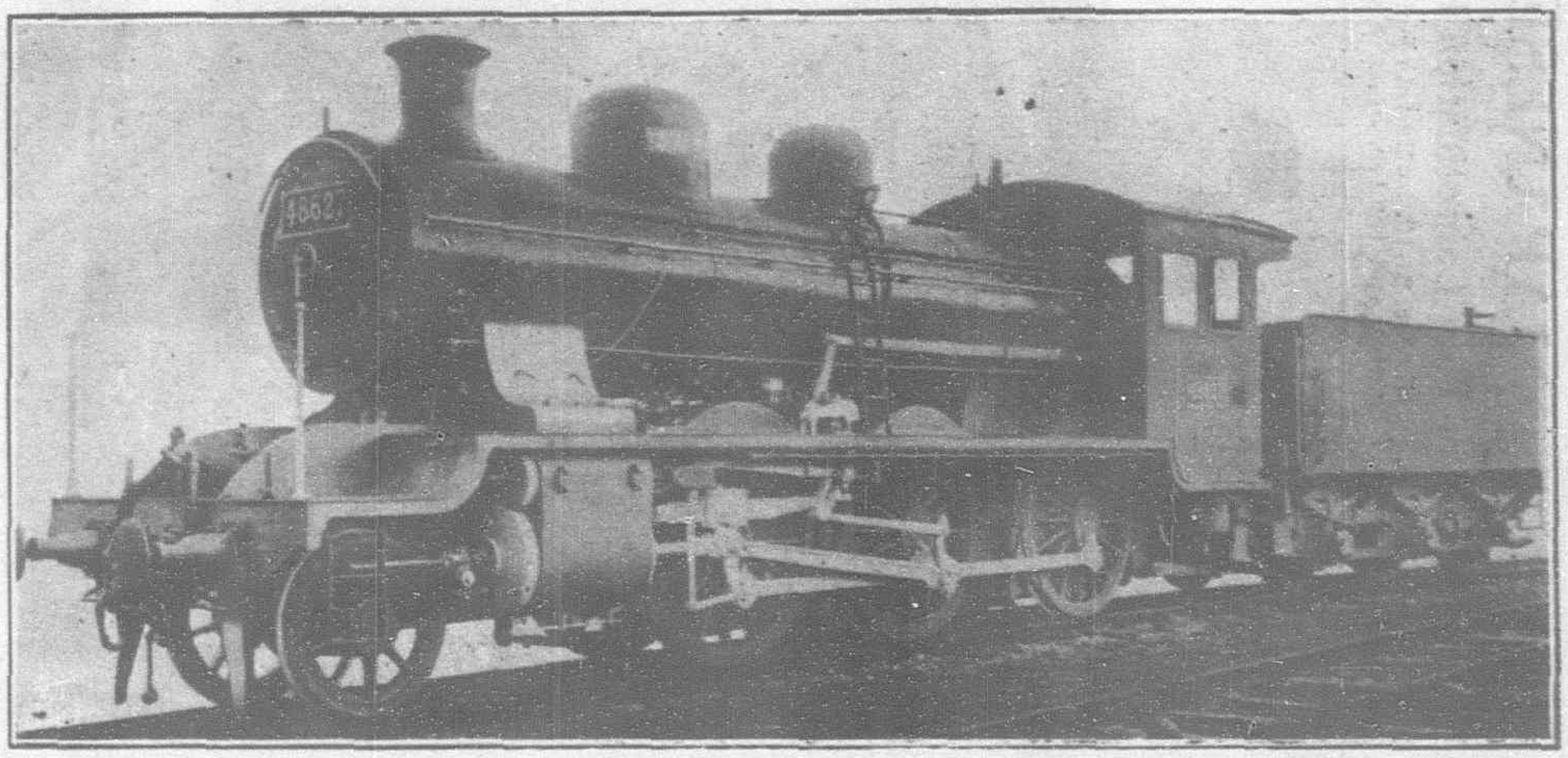
Made in	Installed at Factories	Mines	Others	Total
	%	%	%	%
Japan	84	78	83	82
Foreign countries ...	12	17	—	13
Unknown	4	5	5	5
Total	100	100	100	100

INSTALLATIONS OF BOILERS ACCORDING TO TYPE AND MANUFACTURING COUNTRIES.

(1) Water Tube Type Boilers : Made in	Factories	Mines	Others	Total
	%	%	%	%
Japan	161	47	8	216
Other countries	888	230	22	1,140
Total	1,049	277	30	1,356
(2) Multiple Tube Boilers :				
Japan	4,093	531	412	5,036
Foreign countries	162	69	41	272
Unknown	170	113	21	304
Total	4,425	713	474	5,612
(3) Lancashire Type Boilers :				
Japan	1,167	2,210	61	3,438
Foreign countries	399	537	5	941
Unknown	89	43	2	134
Total	1,655	2,790	68	4,513
(4) Cornish Boilers :				
Japan	4,548	936	583	6,067
Foreign countries	76	2	3	81
Unknown	316	31	11	358
Total	4,940	969	597	6,506
(5) Vertical and Others :				
Japan	1,921	216	603	2,440
Foreign countries	113	26	175	315
Unknown	148	95	72	315
Total	1,882	338	850	3,070
Grand Total :				
Made in Japan	11,751	3,940	1,667	17,358
Made in foreign countries	1,638	865	246	2,749
Unknown	728	282	106	1,116
Total	14,117	5,087	2,019	21,223



The Locomotive Shops of the Hidachi Engineering Works Located at Kasado, Yamaguchi Prefecture

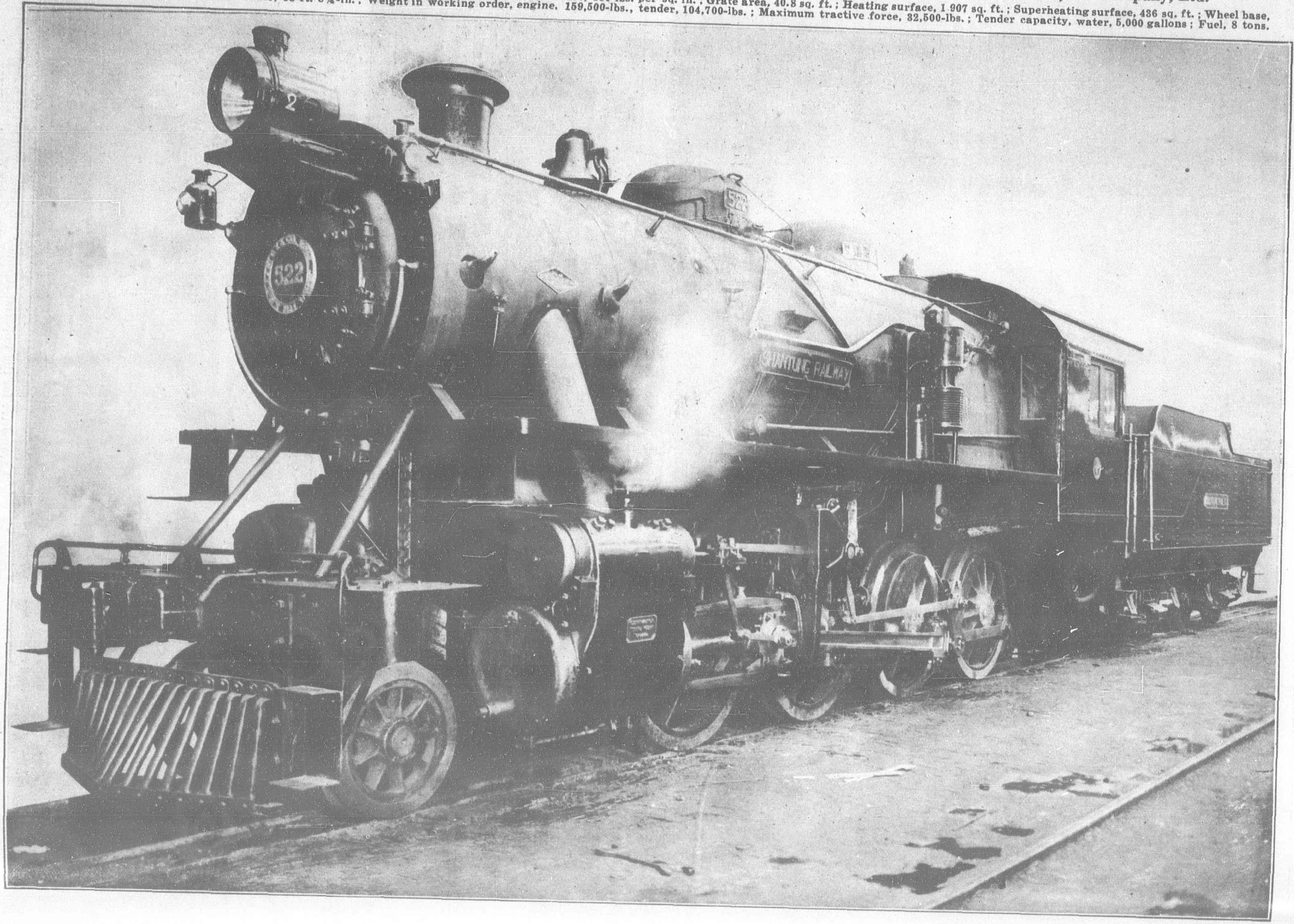


Locomotive for the Imperial Japanese Railways built at the Kasado Shops of the Hidachi Engineering Works

JAPANESE-BUILT LOCOMOTIVES FOR A CHINESE RAILWAY

Type of Four Consolidation Freight Locomotives for the Shantung Railway, built at the Hyogo Works of the Kawasaki Dockyard Company, Ltd.

Gauge, 4-ft. 8½-in. ; Cylinder, 21-in. by 26-in. ; Driving wheel diameter, 54-in. ; Boiler pressure, 180-lbs. per sq. in. ; Grate area, 40.8 sq. ft. ; Heating surface, 1 907 sq. ft. ; Superheating surface, 436 sq. ft. ; Wheel base, engine, 23-ft. 8-in. ; Engine and tender, 53-ft. 8¼-in. ; Weight in working order, engine, 159,500-lbs., tender, 104,700-lbs. ; Maximum tractive force, 32,500-lbs. ; Tender capacity, water, 5,000 gallons ; Fuel, 8 tons.



Short Sketches of Japan's Machine Makers

The Ikegai Iron Works

THE Ikagai Iron Works, makers of machine tools, cutters, gauges, Diesel engines, oil motors, and gasoline engines, stands in the front rank of Japan's great machinery makers. Its products have an international reputation being exported all over the Far East, Russia, and other parts of Asia.

The works are the outgrowth of an enterprise established in August 1890, under the direction of Mr. Shotaro Ikegai, president of the company, which to-day bears his name. The present factory was built in April 1901, since when there have been contant improvements and changes in the equipment, until it is now one of the best equipped modern establishments in Eastern Asia. The present company was organized in April 1913, with a capital of Y.500,000, but so successful was the company's operations during the years of the war that the capital was increased to Y.1,000,000 in June 1915, and in April 1920, to its present figure, Y.6,000,000. In order to meet the war demands, a new factory was built in Tokyo city, in 1916, for the exclusive manufacture of internal combustion engines, and so marked had been its success that " Ikegai " is accepted by exacting engineers in Japan as a guaranty of good workmanship and high efficiency ; a splendid reputation.

The annual production of the company's factories is valued at something like Y.2,500,000 for high-class machine tools, and Y.2,000,000 for internal combustion engines.

During the European war the works were crowded with orders for the Japanese army and navy, and in fact, about 90 per cent. of the present production is absorbed by the military departments, leaving little for export. However, considerable sales were made to Russia, England and Mexico ; the Russian government alone ordering 580 gasoline engines. The " Ikegai " Diesel engines are used on practically all the fishing boats in northern Japanese waters ; 90 per cent. of the fishing vessels of the country are equipped with Ikegai engines, and 10 per cent. with those of foreign make.

The following equipment of the factories is the most modern of its kind :—

Machine Description	*Number*
Lathes, 6′ wide, 40′ long	171
Planers, less than 6′ wide, 25′ long	14
Slotting machines, largest bore, 10″	5
Shaping machines, largest bore, 20″	21
Drills, largest diameter, upright 30″, radius 6′	36
Borers, largest spindle, diameter 4″	19
Milling machines, largest plant No. 4, vertical No. 3	40
Gear cutters, largest 77″	10
Grinders, largest diameter, 20″, 14′ long	45
Screw machines	14
Casting machines	1
Other machinery	73 units
Electric motors, total H.P. 650 each	48

The Ikegai engineering staff numbering 160 is noted throughout Japan for initiative in designing, inventing and obtaining new patents, which total 21 for machine tools, 17 for internal combustion engines, and two for new methods of making internal combustion engines, in all forty patents holding the record for efficiency in Japan. The number of officers and employees of the company is 650.

The head office of the company is located at No. 2, Mita Shikokumachi, Shiba Ku, Tokyo. Its capital is Y.6,000,000, of which Y.3,400,000 is paid up. The officers are : President : Shotaro Ikegai ; Vice-President : T. Chiba ; Directors : K. Ikegai, J. Chiba and S. Ikegai ; Auditors : S. Imai, M. Chiba, N. Chiba and K. Chiba.

Niigata Iron Works.

The Niigata Iron Works were originally started as a subsidiary of the Japan Oil Company to build well drilling machines and supplies to be used in the oil fields of Niigata. They were enlarged time after time, until in 1910 they reached a point where it was considered best to operate them, as an independent concern, with a capital of Y.2,000,000. In 1918, the head office was removed to Tokyo, and the capital increased to Y5,000,000.

In November, 1918, the company purchased the manufacturing rights to the Diesel engine patents of Mirrlees, Bickerton & Day, Ltd. of England, and a new factory was built at Kamata near Tokyo for their manufacture. This factory is 1,755 *tsubo* in area, its machine tool works occupies 243 *tsubo*, the casting room 1,075 *tsubo*, and the woodworking room 80 *tsubo*. There are 95 electric motors in use in the mill, with a total capacity of 1,029 h.p., and some 280 machinery units, besides 12 electric cranes, and four pig iron reduction furnaces. These works were designed to be the most up-to-date, and efficient mill in Japan, but owing to the industrial depression it has never had an opportunity to show its efficiency by running at production capacity. As a matter of fact, the depression has been particularly hard on the Niigata Iron Works, because many advance orders for Diesel engines received in 1918 and 1919, were cancelled at the beginning of the slump, and the huge factory at Kamata has been lying almost idle for more than three years. In recent months there has been a gradual increase in the number of orders received, and the Niigata Diesel engines are beginning to make their appearance in larger numbers on the domestic market. Competition is severe with the older established Ikegai Tekkojo, but the Niigata directors believe that given half an opportunity they can meet all competition, as despite the difficulties in getting its factory into operation, it has one of the most efficient staffs in Japan.

The head office of the company is at No. 3, 1 Chome, Yurakucho, Kajimachi Ku, Tokyo. The officers are : President : Kyukan Naito ; Managing Director : K. Sasamura ; Directors : S. Honma, S. Kagitomi and S. Yamaguchi ; Auditors : H. Kusumi, C. Nakano and K. Saito ; Technical Adviser : R. Onuki ; Chief Engineer of Tokyo and Kamata Mills : G. Moto ; Acting Chief of Niigata Mill : H. Suzuki ; Staff : including engineers, officers, etc., 170 ; Workmen : 2,000.

The mills belonging to the Niigata Tekkojo are :—

Tokyo : Tsukishima, manufacturing exclusively machine tools. Area, 2,300 *tsubo*.

Kamata : Kamata Mura, Tokyo Prefecture ; internal combustion engines exclusively. Area, 30,000 *tsubo*.

Niigata : Irifune Cho, Niigata City ; Shipbuilding. Area, 22,000 *tsubo*.

Niigata : Yamanoshita, Niigata City ; Oil well machinery and supplies ; 21,000 *tsubo*.

Nagaoka : Nishi Kanda, Nagaoka City ; 800 *tsubo*.

Kashiwazaki Branch Works : Kashiwazaki-machi, Niigata City, 1,000 *tsubo*.

Tsuchizaki Branch Factory : Port Tsuchizaki, Akita Prefecture, 1,600 *tsubo*.

Osaka Iron Works

In 1881, Mr. Ryutaro Hanto established the Osaka Iron Works, as a private concern, and was operated as such until April 1914, when it was re-organized as a joint stock company. In June, 1919, it purchased the entire business and equipment of the Bingo Dockyard Co., operating it as a part of its Innoshima Works. In December, 1920, it acquired the Harada Shipbuilding Company's Harbor Construction Works, and established it as an independent factory. The shipbuilding capacity of the Osaka Iron Works by this purchase was increased to over 200,000 tons a year.

Experience of more than 40 years in construction has perfected the technical ability of this company, and together with it up-to-date machine equipment has made it one of the most important shipbuilding concerns in all Japan. In the construction of fishing vessels, light draught steamers, cargo vessels and dredges, this company is recognized as among the best in the country.

The Osaka Iron Works has also built warships, destroyers, cruisers, steamships, dredgers, deap sea fishing vessels, light draught steamers, railway cars, locomotives, electric machinery, land and marine steam engines and boilers. It engages in the repair of vessels, machinery, makes cast iron tubes, bridge materials, and operates a salvage department as well.

The principal works are located at;

Sakurajima Factory: Sakurajima, Nishi ku, Osaka. Chief of Works: M. Fuse.

Harbor Construction Works: Nishi Irifune Cho, Osaka. Chief of Works: K. Hattori.

Innoshima Works: Tsuchiu Machi, Mishirabe Gun, Hiroshima Prefecture. Chief of Works: K. Sasaka.

The Sakurajima Factory and the Harbor Construction Works have two docks and seven slips, besides all necessary workshops. Both factories are engaged in the manufacture of steam engines and boilers, and other types of machinery, as well as in ship construction and repairs. Their equipment is complete, both for shipbuilding and machine making.

The Innoshima Works almost ideal, are used exclusively for the repair of ships. However, since the works were purchased by the Osaka Tekkojo, five new slips have been built, and the works operated for the construction of ships. This factory has a branch at Sannosho.

The Sakurajima Works have a total area of 79,000 *tsubo*, with buildings occupying 15,760 *tsubo*. The Harbor Construction Works occupy 2,670 *tsubo*, while the Innoshima Works, covers 110,860 *tsubo*, with buildings occupying 20,604 *tsubo*. The number of workmen in the shipbuilding department is 3,000, and in the machinery department, 2,500.

The head office is located at No. 2, 2 chome, Hamadori, Dojima, Kita Ku, Osaka City. The stock company organized in March, 1914, is capitalized at Y.12,000,000, of which Y.10,500,000 is paid up. It has reserves of Y.13,355,000. Its officers are: President: Juntaro Yamamoto; Managing Directors: K. Shimomura and H. Taumura; Director and Chief Engineer: Y. Emura; Directors: H. Muraki; Auditors: H. Nishimura and R. Hara.

Wakayama Iron Works

The Wakayama Tekkojo (Ltd.) specializes in the manufacture of machine tools. Originally founded as a private concern by Mr. Takisaburo Wakayama in April, 1899, it was re-organized as a joint stock company in June, 1920, with a capital of Y.2,000,000, of which Y.1,000,000 is paid up. Its principal manufactures are: lathes, planes, shapers, slotting machines, radial drills, borers, milling machines, high-class machine tools, and castings.

The engineers of the company have all been trained abroad, and many promising employees have been sent to America and Europe to perfect their knowledge of the company's manufacturing needs. The Japanese government, army, navy and railway departments and the Yawata Iron Works are its best customers. The works has has been awarded many first prizes at various great exhibitions for the excellence of its machines.

The machine manufacturing department is equipped with: Lathes, 6 to 30 feet; planers, 4 to 25 feet; shapers, from 16 to 32 inches; radial drills, from 3 to 7 feet; milling from No. 1 to No. 3 by 3½; boring grinders, gear hoppers, gear cutters, gear shapers, slotters, millers, etc. In all, 126 units.

In addition, there is one 10-ton traveling electric crane.

The casting room is equipped with one furnace each of 2, 3 and 5 tons, one 10 inch blower, a 10-ton traveling electric crane, two hand operated 3-ton cranes, two drying furnaces, two sandblasts, and two moulding mills.

The gorging workshop has one-quarter ton hammer, two forge furnaces of 4 and 8 feet, and a blower with a diameter of 6 inches.

The mill regulating quality is equipped with two carbonite furnaces, one red bath furnace, three oil bath furnaces, one compressor, etc.

The moulding workshop contains, two 24-inch woodplaners, one 15-inch hand feed planer, one 36-inch hand saw, one 24-inch circular saw, one Benjamin cross cut saw 24 feet; and two 6 feet wood lathes. The transformer stationis equipped with three 50 kilowatt transformers.

The normal annual production is valued at Y.1,800,000, but working at full capacity the mills can produce machines valued Y.3,000,000.

The head office of the Wakayama Tekkojo is located at Minami Ongashima Cho, Nishi Ku, Osaka City. The Representative of the Company is Takisaburo Wakayama; chief engineers: K. Matsubo, B. Matsumoto, G. Hoshino and K. Tsuji.

Kisha Seizo K.K.

The founder of the Japanese railway system, the late Count K. Inouye, established the Kisho Seizo K.K., with the aid of leading business men and officials in 1896, and until the time of his death in London in 1910, retained the position of president of the company.

The principal factory of the company is in Osaka where there is better facility for transportation by land and sea than in any other city in Japan. In July, 1901, the company took over the Hiraoka Mill at Kinshicho, Hongo-ku, Tokyo city, and established it as its Tokyo branch factory. Ever since, in both mills, there has been continuous extensions and improvements of equipment going on.

The principal products of this company are locomotives, passenger, freight and electric cars, bridge materials, brakes, and all kinds of railway supplies. Half of the locomotives in use in Japan have been manufactured by this company. The locomotives for the special express train, type 4-6-2, in use since 1921, were manufactured entirely by the Kisha Seizo K.K. Since the summer of 1922, the company has been busy with orders for locomotive received from the Shantung and Chosen Railways, showing that its products are of the highest efficiency and quality.

In 1915, the manufacture of machine tools was commenced and despite the short time which has elapsed, their specialties have found great favor and merit, because of excellent workmanship and finish. The vertical milling machine exhibited at the machine tool exhibition at Osaka, under the auspices of the imperial department of agriculture and commerce, obtained the first prize for excellence of design and performance.

The "Takuma" type water-tube boiler manufactured by this company and patented in Japan, United States and Great Britain, is recognized by all engineers as particularly effective in fuel economy, ease of transportation, low price, and efficiency.

The company's factories have a capacity of:—

Large type locomotives, annual production	150
Light locomotives	60
Passenger cars	150
Freight cars	15,000
Electric cars	100
Steel bridge girders, and beams	18,000 tons
Machine tools	250 units
Takuma boilers	10,000 h.p.
Railway points	1,000 sets

The main factory at Osaka covers 36, 162 *tsubo*, the Kinshicho mill 8,039 *tsubo*; the Fukagawa (Tokyo) branch mill, 4,412 *tsubo*, and the Sunamachi Mill (Osaka) 68,440 *tsubo*; the Kawasaki Branch Workshop 329 *tsubo*.

Its head office is located at Shimaya Machi, Nishi Ku, Osaka. The company is capitalized at Y.6,000,000, all paid up. The officers are: Directors: Seigo Hasegawa, (Dr. Eng.), S. Imamura, H. Kuzuno, Baron Kishichiro Okura and T. Tanabe; Auditors: M. Shibusawa and Y. Aoki.

Arakawa Seisaku Jo

The Arakawa Works, formerly called the Yanagishima Seisaku Jo, were established by Takata Shokai in 1907. In 1918 it was organized as the Kabushiki Kaisha Arakawa Seisaku Jo, taking over the Yanagishima works, and when the factory on the banks of the Ara River, near Tokyo, was completed, the removal was made.

This company is especially well known for its centrifugal and spiral pumps, water turbines, turbo-blowers, and fans of all kinds, cranes, boilers, mining, and chemical machinery and railway materials. The most recent feature of this company's manufacture is a coal handling and conveyor apparatus.

The factory consists of a forge room of 93 *tsubo*, boiler works of 368 *tsubo*, machinery and finishing works of 429 *tsubo*, casting room of 306 *tsubo*, wood working room of 100 *tsubo*, and warehouse of 195 *tsubo*.

The machinery equipment is as follows: Electric motors, with capacity of less than 60 h.p. each, 18. Electric power is supplied by the Rokyo Dento K.K., 300 k.w. The woodworking room is equipped with a 16-ft. by 6-in. woodplaner, a 16-in. band saw, circular saw, wood lathe, etc.

The casting room contains a 1½, 2 and 4-ton cupola crucible furnace for gun metal, sand drying room, and a 30-inch turbo blower, cranes, etc.

This company has also a can-making department equipped with shearing and punching machines, pneumatic riveter, plate bending roller, and a 7½ h.p. blower. The finishing works are equipped with lathes, surface lathes, horizontal boring machines, etc., numbering 71 in all. There are about 500 workmen employed all the year round.

The Arakawa Seisaku Jo's factory is located at 3360 Okumachi, Kita Toyoshima Gun, Tokyo Prefecture, and its office is at No. 1, 3 chome, Yuraku Cho, Kojimachi Ku, Tokyo, care Takata Shokai. It is capitalized at Y.1,000,000, all paid up. The officers of the company are: President: Kamakichi Takata; Directors: S. Iwasaki, Y. Ikeda and R. Takata; Auditors: K. Matsuda and S. Matsumoto.

Karatsu Iron Works

Originally a department of the Takeuchi Mining Co., in 1909, the Karatsu Tekkojo was established as an independent corporation, with a capital of Y.2,000,000, of which Y.500,000 is paid up.

This company engages principally in the manufacture of machine tools, precision instruments and parts thereof, as well as electric motors. The president, Mr. Toshisuke Takeo, a well-known mechanical engineer, has established a reputation in Japan for the excellence and severe testing of the company's specialties before being placed on the market. The chief merit of this company's machinery is its accuracy.

The works occupy a site of 6,800 *tsubo*, of which 1,900 *tsubo* is covered with 24 buildings. The works are equipped with lathes, planers, boring mills, boring machines, grinders, cupolas, drills, shapers, milling machines, gear cutters, slotters, pneumatic hammers, cranes, pumps, air compressors, shears, rolling machines, presses, punching machines, engines, dynamos, moulds, etc., to the number of 180. There are 400 workmen employed.

The total annual production of the factory is valued at Y.1,000,000, but annual sales have reached Y.1,150,000. The navy and military arsenals, shipbuilding companies, and arms manufacturers are its principal customers.

The selling branches are:

(1) Karatsu Tekkojo, Business Office, 7th Floor, Marunouchi Building, Tokyo.

(2) Osaka Branch, Takeuchi Mining Co., No. 3, 2 chome, Minami dori, Edobori, Nishi Ku, Osaka City.

The Officers of the Karatsu Tekkojo are: President and Engineer-in-Chief: T. Takeo; Directors: J. Kondo and H. Matsumura.

The Oi and Hamamatsu Shops of the Imperial Railway Department

The Oi Shop of the Imperial Government Railways is mainly engaged in repairing passenger and freight cars, and electric cars. The Hamamatsu Shop is operated exclusively for the repair of locomotives.

The Oi Shop, in addition to repair work, constructs sleeping, dining and observation cars, at the rate of one or two carriages a month. Besides, it repairs petty supplies required by stations and on the lines of the railroad. The number of carriages repaired during the year ended March 31, 1923, was 1,236 passenger cars, 6,427 freight cars, and 831 electric cars. The average number of carriages in the shop per day was 23 passenger cars, 18 electric cars, and 57 freight cars.

The reconstruction and repair of locomotives is the chief business of the Hamamatsu Shop. In addition, some miscellaneous repairing is often undertaken. The number of locomotives under the supervision of this shop is more than 600, all included in the district around Tokyo, Iiidamachi, Hamamatsu, Nagoya, Maibara, Tsuruga, Fukui, Kanazawa, Nakatsugawa. The number of locomotives repaired during the year ended March 31, 1923, was 509, the daily average in the shop amounting to 11.

The Oi Shop has an area of 88,000 *tsubo*, with 12,000 *tsubo* covered with buildings, and six miles of switch lines within the yards. The number of machines installed is 550, operated by electricity, steam and compressed air. The works receive current from the Yanokuchi Power Plant, belonging to the railway department, at a pressure of 11,000 volts, 50 cycles, three-phase alternating current, stepped down to 3,300 volts by three 150 kva. transformers, at the works, and is again transformed into direct current of 500 volts by a 250 k.w. generator, from which the power is distributed over the shops. Most of the machinery is operated at this voltage, but a recent addition is operated by a 200 volt three-phase alternating current. When the voltage used on the government railway suburban lines around the city of Tokyo is changed, the greater part of the machinery in this workshop will be operated by this current. Preparations are now being made to enable this change to be made in the least possible time. The amount of electric power now consumed each month is 55,000 kilowatts.

Steam power by five Cornish boilers, and one Takuma type water-tube boiler, operates six steam hammers and one or two other special machine in the tempering works and supplies steam for heating the shops. The boilers are fitted with apparatus for burning coal dust.

The casting mill is equipped with one 1-ton and one 3-ton furnace, which turn out something like 136 tons of pig iron a month. At the same time, three furnaces turn out 6½ tons of gun metal castings a month.

Hamamatsu

The Hamamatsu Shop has an area of 68,000 *tsubo*, of which 6,600 *tsubo* is covered with buildings. The switching track is 4 miles, 66 chains long, and there are 470 machinery units installed. The plant is operate like the Oi Shop, by electricity, steam and compressed air. The monthly consumption of electric power is 158,000 kilowatts.

Steam produced by two Babcock and Wilcox boilers, is used chiefly in operating the machinery in the smithy. Among these there are seven steam hammers. Compressed air is produced by a 250 h.p. electric driven air compressor, at a pressure of 100-lb. per sq. inch. Hydraulic power is used almost exclusivelyfor the riveters.

The setting up room, together with the lathe room are built in one reinforced concrete building, equipped with two 40 tons lifting cranes, one 20 tons, one 10 tons, one 15 tons, and two 5 tons cranes. The casting mill has two furnaces, with capacities of 2 and 5 tons, with an average monthly production of 133 tons. Three brass furnaces turn out approximately 24 tons of gun-metal castings a month.

There are 1,400 employees at the Oi Works, and 1,200 at the Hamamatsu works, exclusive of 200 members of the office staff at Oi.

Praise for Japanese Engineers

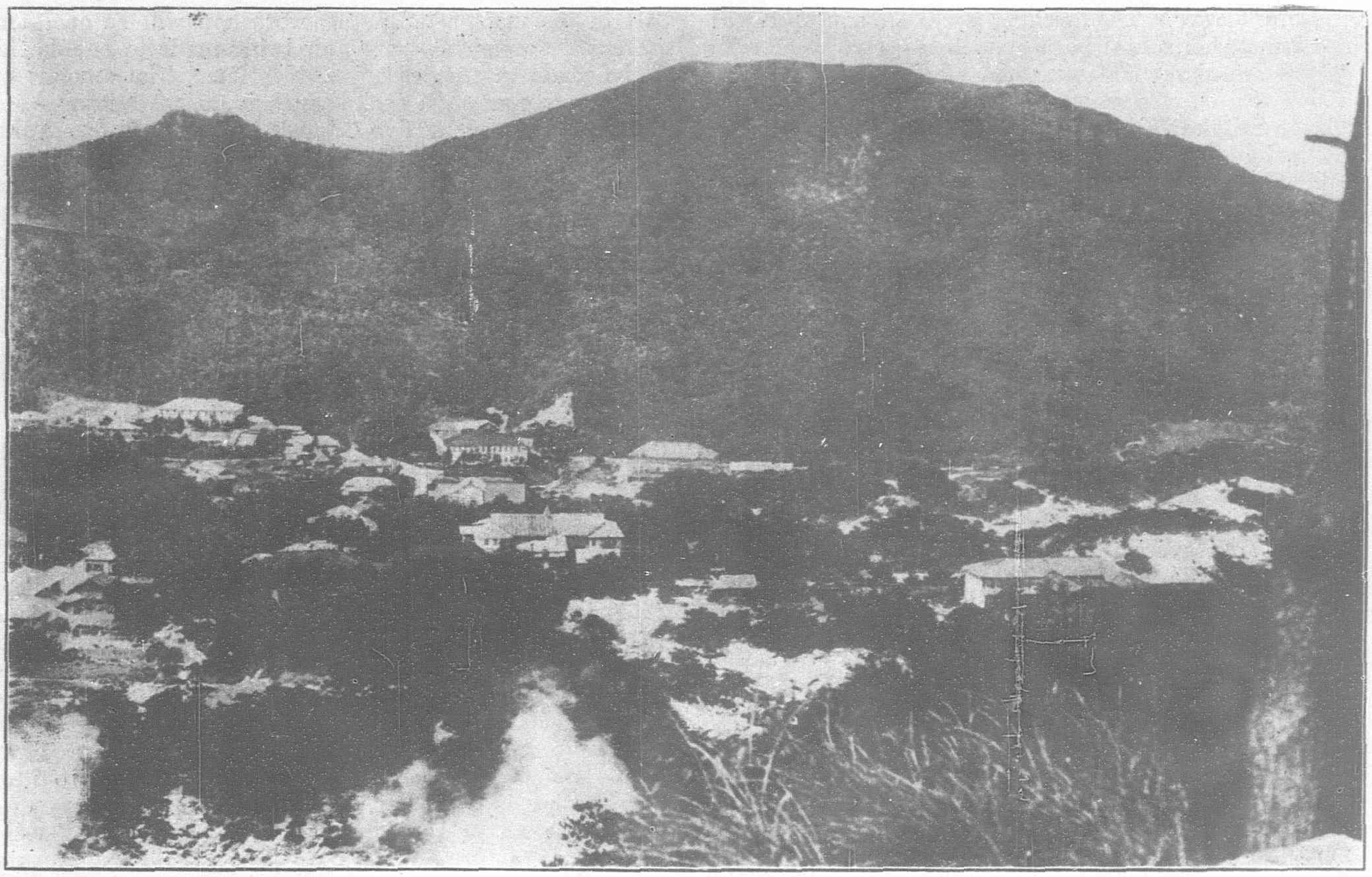
ELMER A. Sperry, head of the Sperry Gyroscope Company, who recently made an extensive trip in Japan, as the spokesman of American engineers, declared in an address on his return to Brooklyn, that the report that the Japanese had a feeling of unfriendliness and antagonism toward the United States was nothing but propaganda. He said friendship and goodwill were the dominating features in Japan's relations to the United States.

"The Japanese engineers, particularly," said Mr. Sperry, "have placed American engineers on a pedestal and they were overcome by the warm tribute from America's engineers which I carried to them. Japan is not a mation of copyists. The Japanese think for themselves, and think quicker than we do. It is said they come here for their ideas and carry them away for use in their own land. Since I have visited them I have realized that for every idea they adopt from us they reject 100."

Mr. Sperry characterized the Japanese as earnest workers possessing quicker mental reactions than the Anglo-Saxons. He declared that Japan's curve of advancement is twice as great as ours.

"Japan is not a land of paper houses as it is sometimes pictured," said Mr. Sperry. "Its buildings are huge stone structures which will stand for thousands of years, provided, of course, earthquakes do not obliterate them. Japan surprised me. I found it literally a mass of mountains with only one-eighth of the land tillable. I can't understand how a race ever grew there, and yet their minds work marvels. Their methods of construction are the latest and in some cases more advanced than ours. Their big shipyard is five times the size of any of our yards over here. They are the biggest gun manufacturing people in the world. Over here we engineers take pride in the fact that Brooklyn Navy Yard has the largest horizontal boring mill in the country, but the Japanese have one which is the largest in the world.

"The Japanese engineers were overcome when I bore to them the tribute from American engineers. They did not realize we knew they existed. It is already arranged for American and Japanese engineers to come into a closer relationship and understanding and the combination will accomplish great things."



General View of Unzen

UNZEN

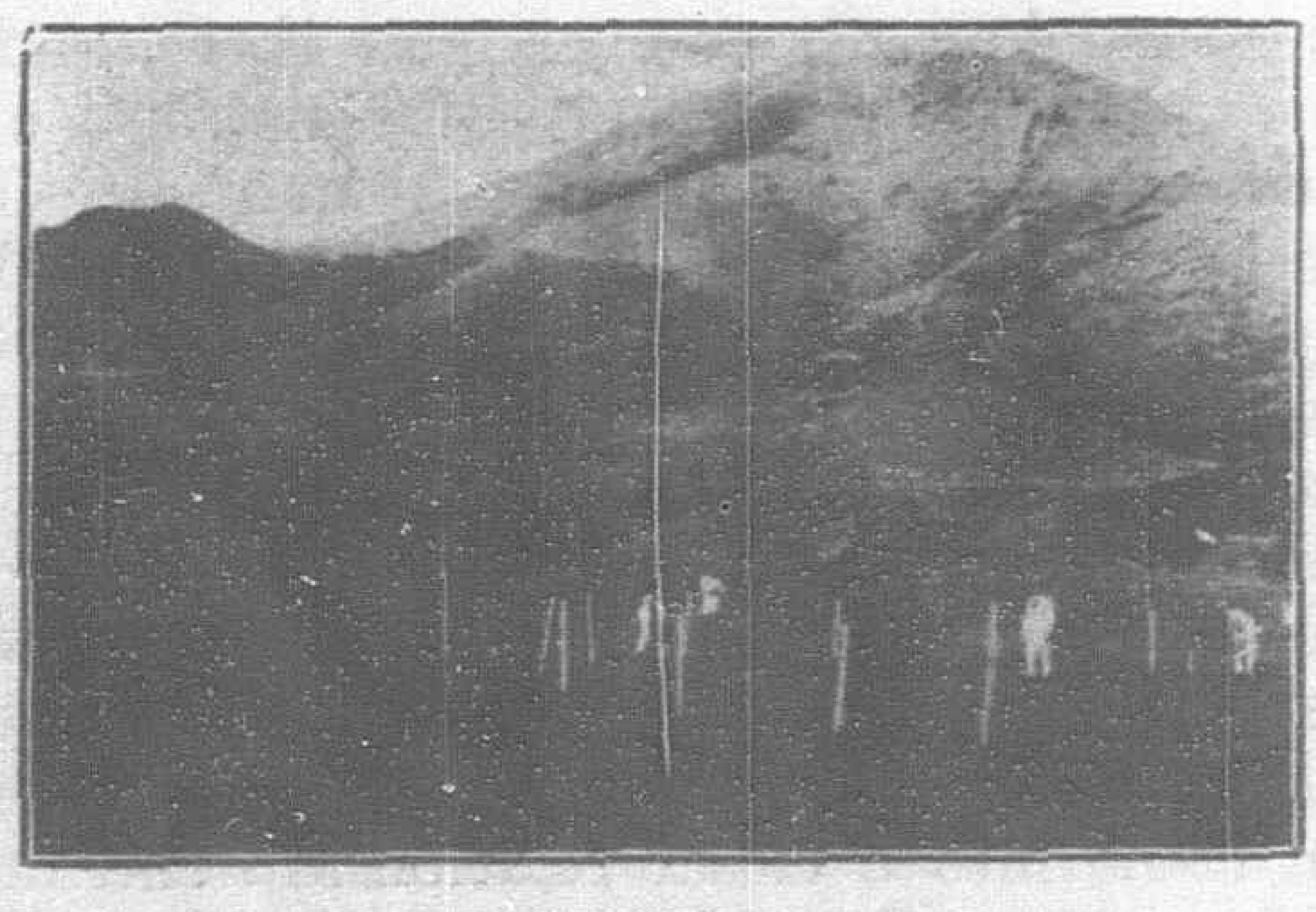
The Summer Playground of The Far East

WITH the coming of summer, foreign residents in the Far East are looking for a place to enjoy their well-earned vacations. Tsingtau, an old favorite watering place, is considered by many as too unsafe at the present time; Peitaiho in the Chihli-Fengtien war-zone, was recently raided by unpaid soldiery; Kuling and other interior resorts will have to be guarded, so it can be fairly said that foreigners are not so keen this year to spend their vacations in places where they may be exposed to the fury of the bandit pest which makes life and travel unsafe outside the most important treaty ports. Repulse Bay in Hongkong is favored by many because of the security offered, in addition to the most charming surroundings and opportunity for excursions. But this resort has its limitations; it cannot cater to the vast number who will seek relaxation and recreation during the summer that is now upon us. There remains Dairen and Port Arthur with their splendid beaches and accommodations, or the Diamond Mountains in Korea, but again the capacity of these resorts is limited and to obtain rest with security the foreigner must turn to Japan.

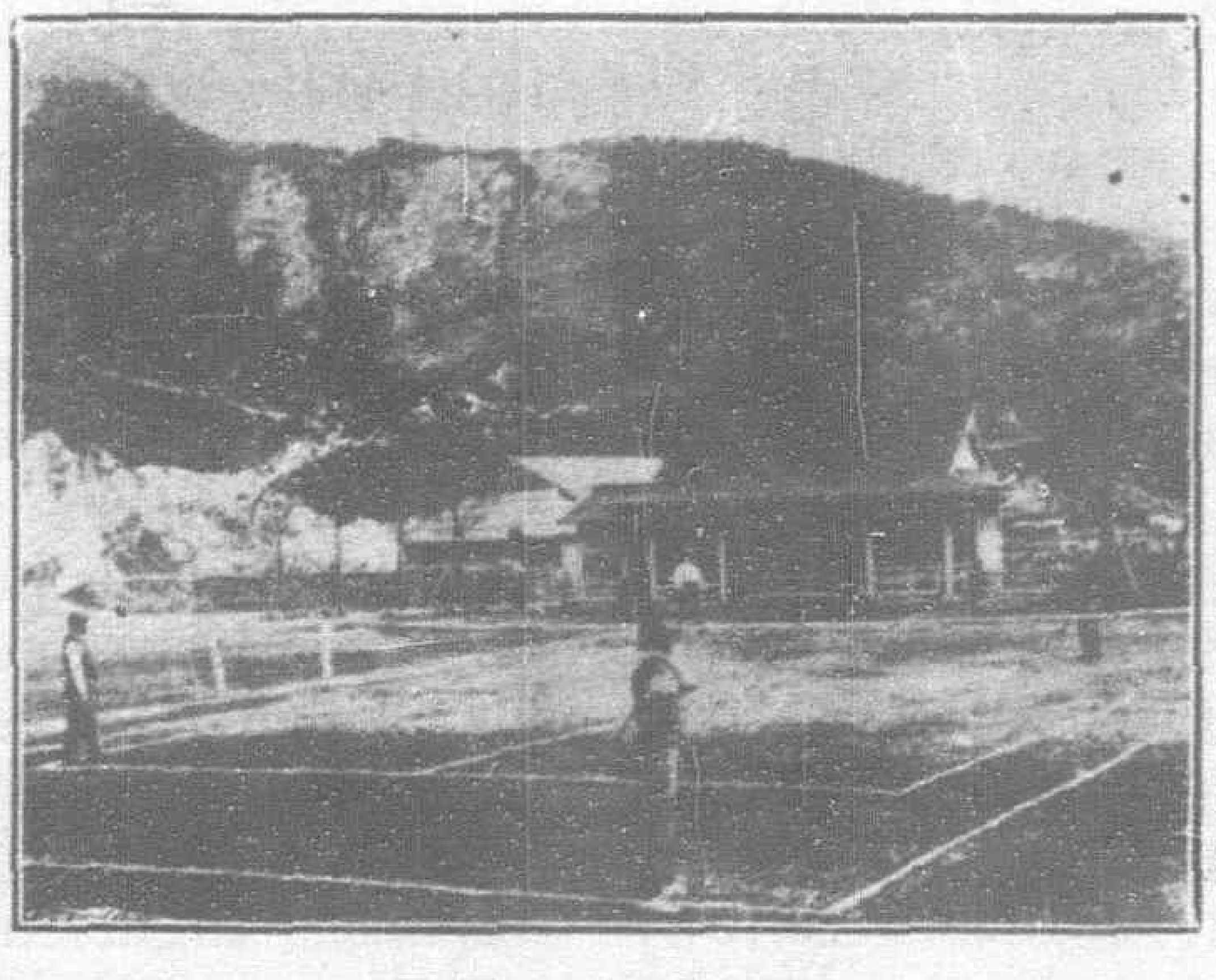
Amongst the many admirable health restors and playgrounds in this charming empire, the nearest and most convenient to the China coast is located at Unzen, not far from Nagasaki. To meet the demand for rapid transportation the N. Y. K. is now operating two up-to-date express steamers (the *Nagasaki Maru* and *Shanghai Maru*) which makes the trip between Shanghai and Nagasaki in 28 hours. Unzen, only a day and half distant from Shanghai by these luxurious steamers, is each year becoming more and more a favorite place for the health seeker and to popularize and bring its advantages forcibly before the Shanghai public the N. Y. K. recently invited the newspapermen and their wives of this port to visit the resort.

Unzen

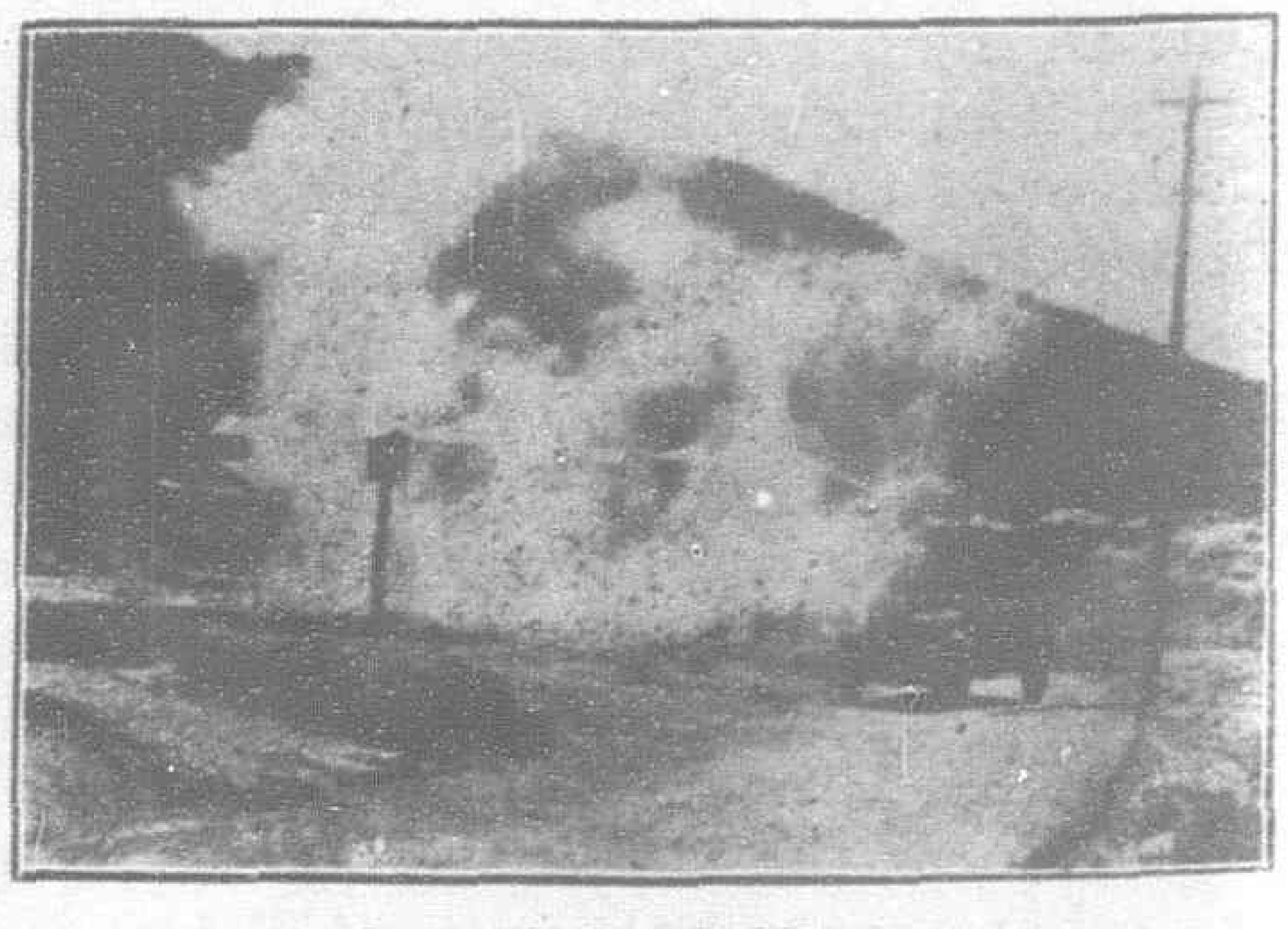
In the middle of the Shimabara peninsula, which lies about twenty miles to the east of Nagasaki, rises a range of mountains called Unzen-dake. This range consists of several peaks, known as Fugen, Kunimi, Myōken, Yatake, Nodake, and Takaiwa, the



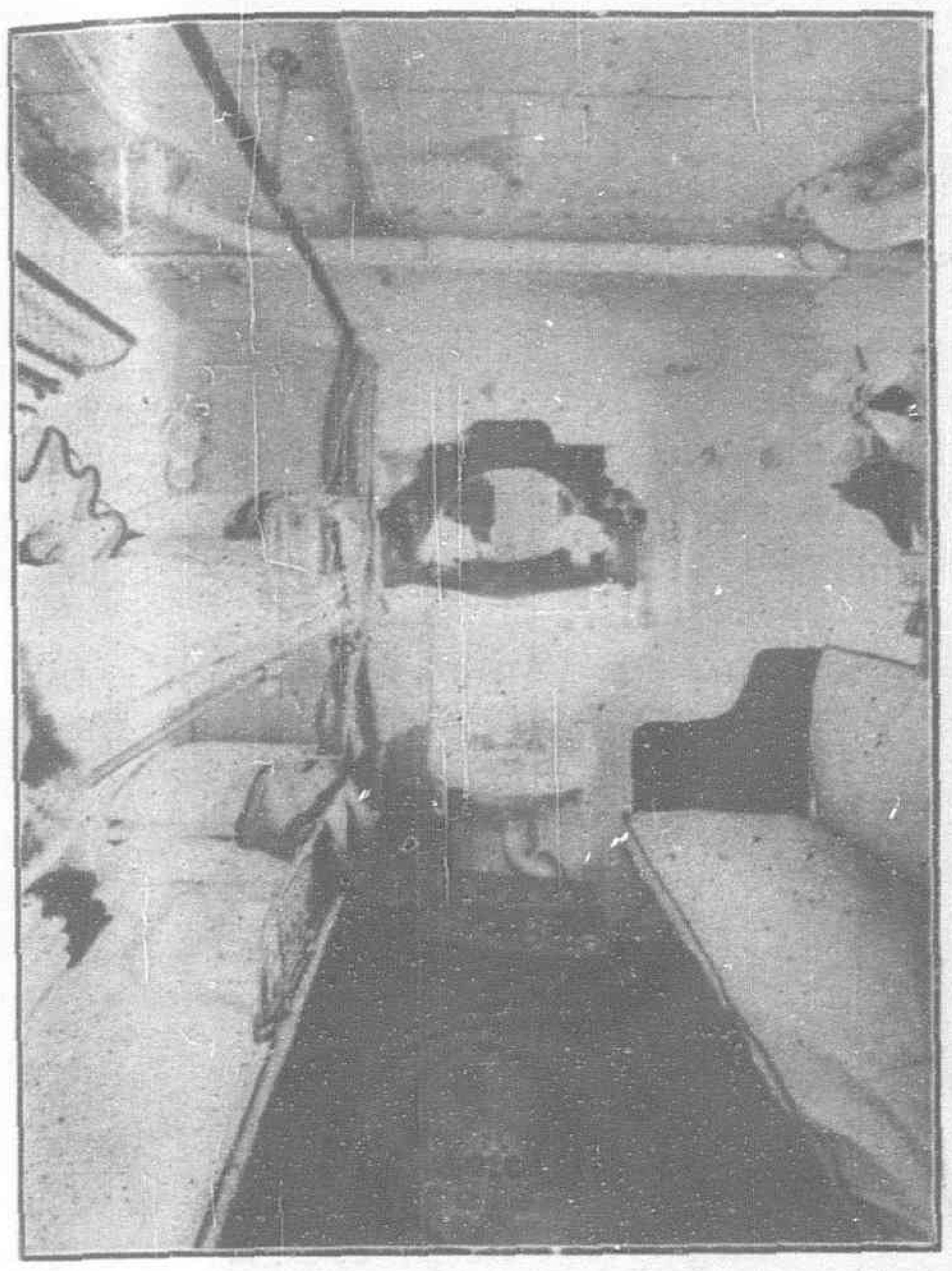
Golf Course



Tennis Court



One of the Solfataras


First Class Two Berth Cabin

Boat Deck

First Class One Berth Cabin

first mentioned being the highest and standing 4,461-ft. above sea-level.

Amidst these peaks lies a horse-shoe-shaped plateau on which a golf course has been laid out. There are nine holes and the length of the course is 2,604 yards. Grass-covered and sprinkled with azaleas bushes, the links are very attractive, especially in May when flowers of many varieties are in bloom.

Unzen park is situated on a plateau in the centre of the range and is 2,400-ft. above the sea-level. It contains numerous solfataras and fumaroles from which issue steam and gases, in some cases to a considerable height. They are known locally as *jigoku* (hells) and some are the fine spectacles. There are seven hotels in the park.

Unzen is an ideal summer resort. The air is pure and refreshing and every place on which the eye rests is green. About half-a-mile below the plateau is another group of fumaroles, called *kojigoku* (small hell), in which hot water bubbles.

About $6\frac{3}{8}$ miles lower down stands Obama, a village on the seacoast noted for its saline hot springs. Here are several inns and one hotel.

To reach Unzen from Nagasaki two routes may be taken, one involving a sea journey, and the other going overland. Choosing the latter, the journey is made by rail from Nagasaki to Aino, changing cars at Isahaya.

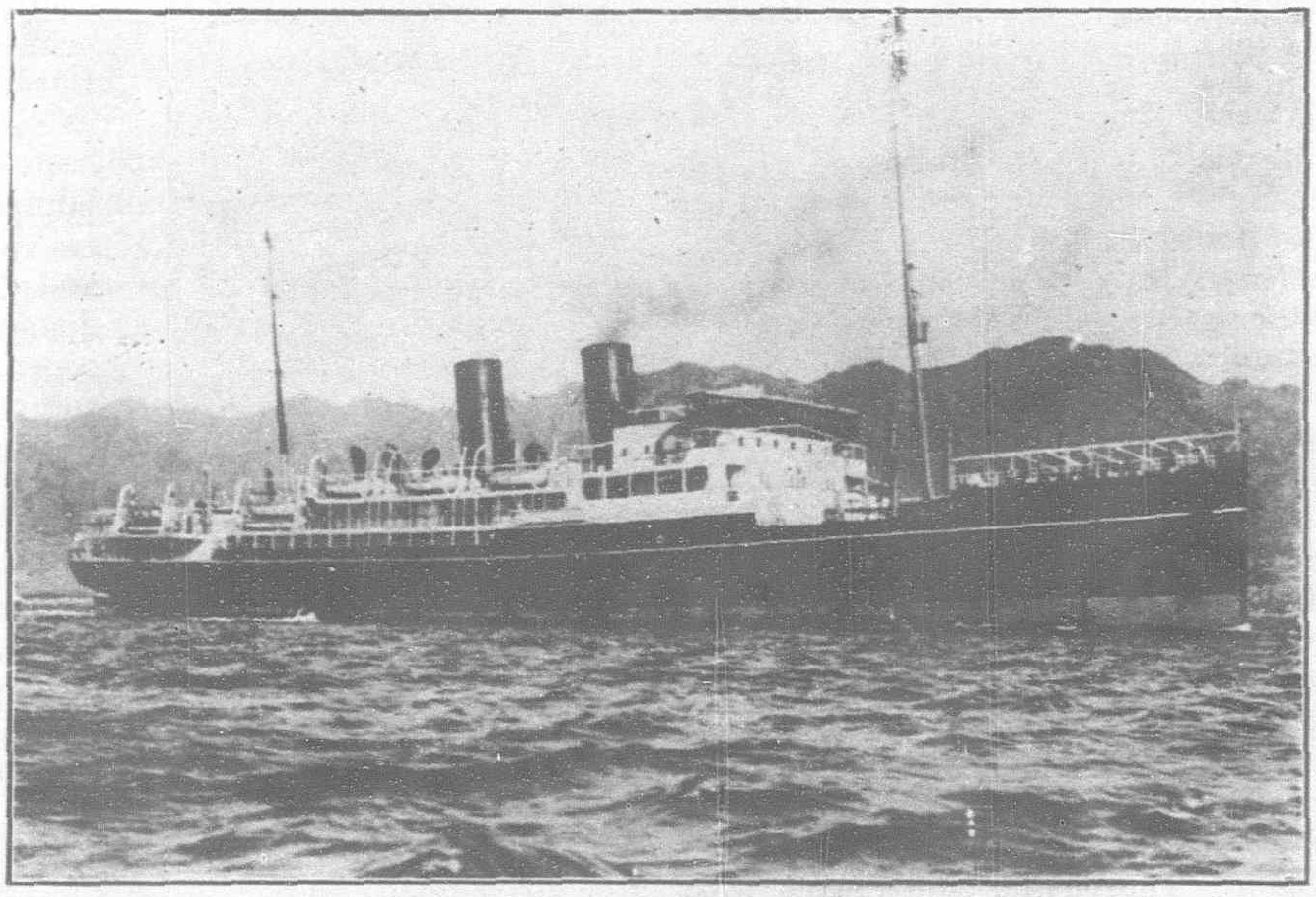
From Aino, motor 'bus is taken to Chijiwa, via the Chijiwa slope, and then on to Obama, via Koba which is a junction to Unzen, and via Tomitsuzaka, giving a beautiful coast scenery.

Chijiwa is situated about four miles from Aino, and about $8\frac{1}{2}$ miles from Unzen. An attraction of Chijiwa is its sea-bathing which can be enjoyed on a fine sandy beach sheltered by a beautiful ridge of pine trees. The road from this village to Unzen lies along the beautiful valley of the river Chijiwa which has its source at Unzen, turning off from the high road at Koba is now opened.

The ascent by this route can be made by motor cars, and is about $3\frac{1}{2}$ miles shorter by overland than by the Obama route.

To reach Unzen by sea, ricsha or motor 'bus

(*Continued on page 397*)


N.Y.K. Expres Steamer "Nagasaki Maru"

Smoking Room

Social Hall

Dining Saloon

Siam Advancing

WITH China prostrated by reason of civil war and a general breakdown of guarantees, it is not surprising to find that other parts of the Far East are taking advantage of the general interest in this part of the world, to advertise their resources and the opportunities for investment unders table conditions. We find the authorities of Indo-China launching a well-defined campaign of education in France and in America; the Dutch East Indies are making strenuous efforts to bring to the attention of other countries the vast possibilities awaiting capital in the development of their many resources; the Philippines are enjoying a revival of interest under the competent rule of General Wood, while Formosa and Korea have embarked upon extensive programs for the betterment of industries and transportation. Siam is forging ahead with a comprehensive scheme for the construction of roads and railways, irrigation systems, forestry, mining and general industrial development and is commanding general admiration for the manner in which these are being pushed to completion. All parts of the Far East other than China enjoy the confidence of the money markets and have succeeded in floating loans for productive purposes, opening vast markets for foreign materials and increasing the general prosperity in the various countries.

The King and Queen of Siam

Much of Siam's progress is due to the intelligent attitude of a ruler, alive to the necessity of introducing foreign capital that will eventually benefit his people. He welcomes serious investigators and encourages legitimate enterprises. Aside from being interested as a ruler in the general welfare of his country, the King of Siam is personally and financially interested in many commercial enterprises for the development of national resources. With the reputation of being one of the most enlightened and benevolent crowned heads of the world, his personality is one of the great assets of Siam. Thoroughly conversant with European politics and several languages, he is specially equipped for the arduous task of leading his people along the highway to national prosperity. He is said to be a good listener and gives careful attention and consideration to all proposals.

The King of Siam is at present considering the investment of a part of his private fortune in the establishment of a Siamese shipping company that will provide the trade of the country the foreign connections now lacking. It appears that considerable dissatisfaction exists with present shipping arrangements under foreign control. The complaints of discrimination and lack of attention on the part of the shipping lines serving Bangkok, convinced the king that much trade was being lost through inadequate ocean transportation, and it is now planned to purchase the necessary tonnage in order to maintain lines deemed essential to the development of the rice trade The proposed new navigation company will at first operate time chartered vessels, and if the venture proves profitable, sufficient tonnage will be bought outright and operated under the Siamese flag.

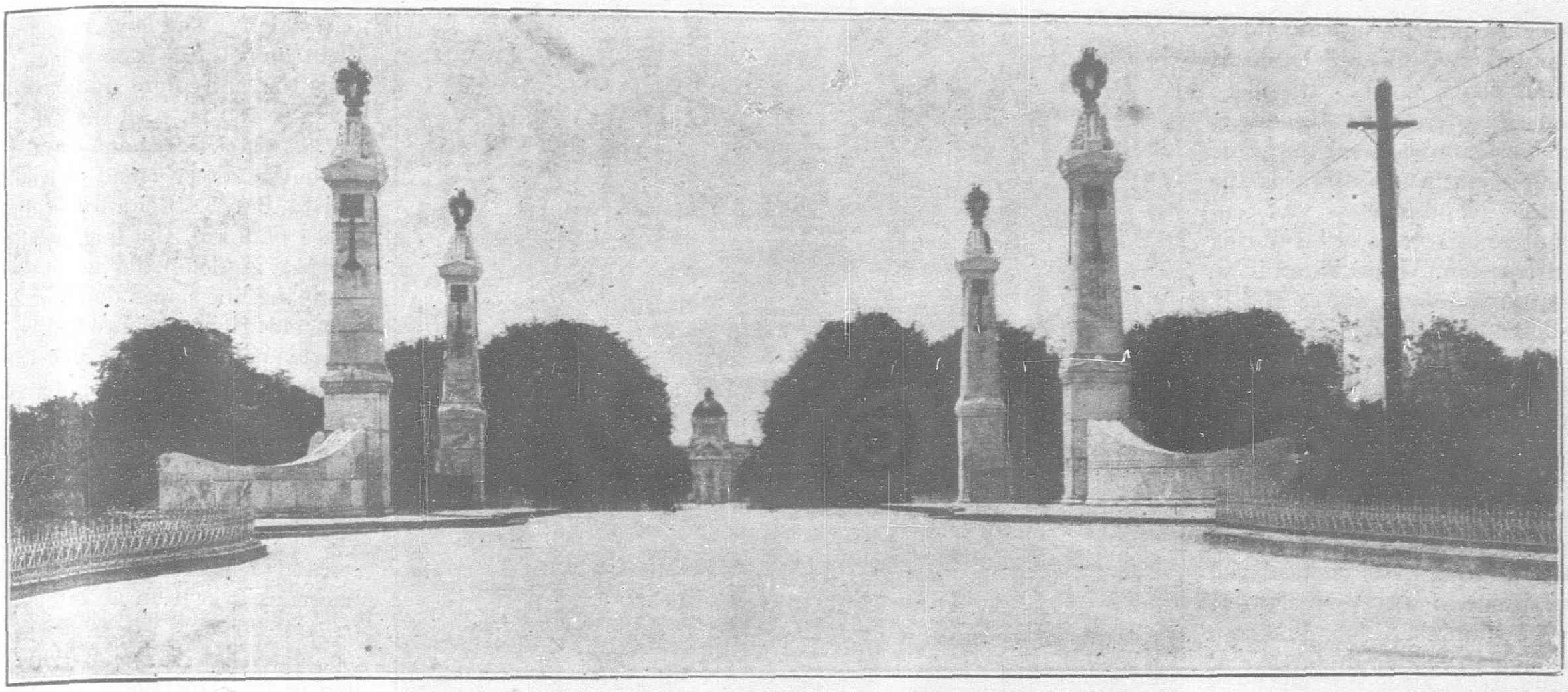
Considerable rice business in Shanghai and North China has been lost to Siam owing to the lack of transport. One of the proposed lines will cover the Chinese ports, while other lines will be operated to the West Indies and Europe. The same difficulty has been experienced by Siam in competing with other rice-producing countries for cargo space, with the result that a large volume of business has been lost in important rice transactions.

The promoters of the shipping company believe that the movement of tonnage in Siam and the volume of imports and exports will fully justify the investment and advance the national interests. The total tonnage entering the port of Bangkok during the Siamese year 2464 (equivalent to the Christian Era, April 1, 1921 to March 31, 1922) was 984,199, or 957 vessels. The rice trade, upon which the country relies largely for its prosperity, showed an export of 21,000,000 piculs or nearly 1,300,000 tons valued at Ticals 138,231,000 or £13,000,000. In addition, Siam exported teak wood to the value of Ticals 7,111,000 and other commodities valued at Ticals 13,601,000.

These figures show that the trade situation in Siam hinges largely upon the rice crop and the ability to market the product in competition with the other great rice-producing countries, Indo-China and Burma. Fortunately, the rice-crop in Siam for the past two years has been excellent, last year bringing a bumper crop. The foreign demand for rice. especially in British India and China, has naturally a great influence on the prosperity of the country, as also the harvests of competing countries. With assured transportation and reasonable freights, the outlook for Siamese exports is considerably brightened. It is to assure this that the king is encouraging through his private purse the establishment of a purely Siamese fleet of ocean carriers.

Siam has been exceptionally fortunate in the matter of finances under the wise rule of the present king and his father, and to-day the government budget just about balances; the revenues for 1920-21 being Ticals 86,105,575 and the expenditures 86,128,899 while for 1921-22 the revenue was estimated at Tsc. 77,800,000 with expenditures at 82,032,582, an estimated deficit of over four millions. The national debt of Siam arises from four loans contracted, respectively, in 1905, 1907, 1909 and 1922, all for productive purposes and mainly for railway construction. The total debt to 1922 amounted to £8,837,840 made up of a balance of £810,220 on the 4½ per cent. sterling loan of £1,000,000 issued in 1905, £2,547,620 of the 4½ per cent. £3,000,000 loan issued in 1907, £4,480,000 of the 4 per cent. loan from the Federated Malay States of £4,750,000 issued in 1909 and £1,000,000 of the 7 per cent. loan of £2,000,000 contracted through the Hongkong and Shanghai Banking Corporation in 1922. The first two loans are being repaid according to the amortization schedule and interest charges on the others are being met. In view of the railways and other public works and assets of the government, the amount is most reasonable and shows Siam to be in a strong financial position.

The average of imports over a period of five years shows Tcs. 123,932,615 and exports of 138,752,300.



A Modern Bangkok Street : Approach to the Marble Throne Hall

Siam State Railways

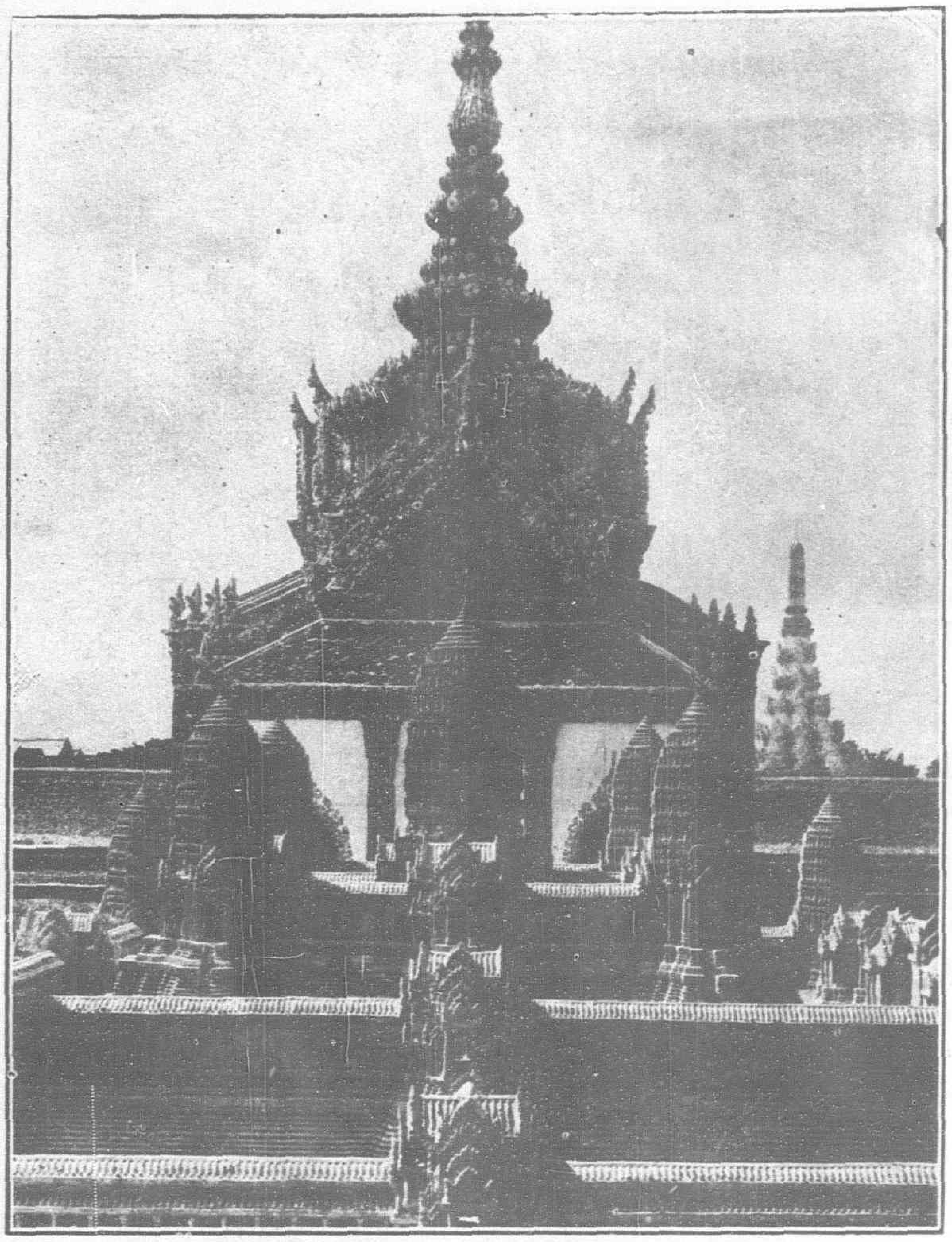
Report for 1922

ADMINISTRATION:—Commissioner General and Chief Engineer, General H.R.H. Purachatra, the Prince of Kambeang Beja; Asst. Commissioner General and Chief Mechanical Engineer, H.S.H. Mom Chow Chalart; Chief of Technical Services, G. Canova; Chief Engineer of Ways and Works, R. F. Smyth; Traffic Superintendent, H.E. Phay Prasiddhi Salakara. The total staff and labor of all classes in the department was at the close of the year ending March 1922 for the railways 13,655 of which 10,489 are Siamese and 24 Europeans. The total length of the state lines opened to traffic is 2,370 km. and the length of these lines under construction is 526 km. The total capital outlay is to date Tcs. 131,220,610 with an average capital cost per kilometre of open line of Tcs. 55,367.

Korat Line.—The first line built in Siam is the Korat line 264 km. long which was started in 1892 and opened to traffic at the end of the year 1900. This line runs over the central paddy plain of Siam with a very gradual rise of some 18 metres in all up to Gengkoi 125 kilometres from Bangkok. At this point the rail level is 22.52 m. above M.S. L. and from here the line starts to climb up the watershed at the edge of the well-known Korat plateau. The governing gradient was fixed at 23.6 per cent. and the minimum radius for curves was 200 m. The highest level on this line is 399.31 m. M.S.L. and is at 170 km. and therefore a climb of some 377 m. was accomplished in a distance of 45 kilometres. This part of the line is full of curves winding in and out amongst the mountains. No great difficulty was encountered during construction even in this most difficult section. But owing to the climatic conditions malaria, raging on the district Gengkoi-Lat Bua Kao, accounted for many deaths among the labor as well as the officials. From this point the line is right on the Korat plateau and the gradient slopes gently down towards Korat 189 m. above M.S.L. This line is now being extended 311 kilometres furher to Ubol Rajdhani a town not far from the Mekong River. Twenty kilometres of this new extension Korat-Tachang is now opened to traffic. The third rail on the Bangkok-Korat section has been completely laid and now metre gauge as well as broad gauge trains can run on this line.

The Marble Throne Hall, Bangkok

Northern Line.—During the year 1897 the construction of the Chiengmai line was taken in hand and as soon as each section from Ban Phaji northwards was ready it was handed over to the traffic. The first section to Lopburi commenced to carry passengers and goods on the 1st of April, 1901 while the whole line was completed on the 1st of January, 1921. This line branches off from Ban Phaji junction on the Korat line 90 km. from Bangkok and runs due north parallel to the Menam River up to Utaradit (394 km.) and thence to Chiengmai a distance of 750 km. from Bangkok. From Ban Phaji to Utaradit the line runs along the central rice-producing plain of Siam passing on its way the important town of Paknampoh, Pichit, Pitsanuloke and Ban Dara junction where another line 29 km. in length branches off to Sawankaloke. Bangkok is 2 m. and Utaradit 66 m. above M.S.L. It will be seen, therefore, that the line is practically on the level, the grade being slightly up towards the north. No difficulty was encountered in this section during construction. From Utaradit to Den Java 155 m. above M.S.L. and 49 km. distant the grade begins to go up more steeply. Two tunnels had to be cut in the rocks before Den Jaya was reached; one 109 m. long at 422.800 km. and the other 362 m. long at 425.500 km. In this section difficulty in the shape of malaria fever was encountered and progress was very slow at the beginning. The line ran through a thick virgin forest and the engineers and coolies all suffered badly through attacks of fever. However with patience and endurance the work of clearing the forest was got through and the fever trouble overcome. From here the line runs amongst the hilly district of the north and there is a gradual climb up to maximum height of 405 m. above M.S.L. at 526 km. Hence the line slopes gradually down towards the Lampang plain to Lampang 550 km. and 232 m. above M.S.L. From Lampang the gradient is again up towards the north. Up to 594 km. no further difficulties were encountered during construction. The most important work of the whole of the northern lines was reached here, viz., the Khun Tal tunnel 1,354 m. long. This tunnel was completed in the year 1918. Black water and malaria fever raged over the district and at one time the death rate was fairly high. The governing gradient on this line is 25 per cent. and the minimum radius for curve is 180 m. All the curves in this district are compensated. From the northern end of Khun Tal to Ban Ta Champoo a distance of 9 km. the longest and steepest grade on the line exists. Here the line slopes down at 25 per cent. right down to 603 km. At this point the river Meh Tah is crossed by the only reinforced concrete railway bridge in Siam. It is of two spans of 40-in. each. The bridge is of the arch type with suspended floors having expansion joints in the centre of each span, and the line runs over it on an ordinary ballasted track. The bridge was completed at the end of 1921 just in time for the opening of the northern line through to Chiengmai and is one of the outstanding features of this line. This hilly portion, though difficult to construct now, becomes a treat for the traveling public on account of the unsurpassed grandeur of the scenery passed through.



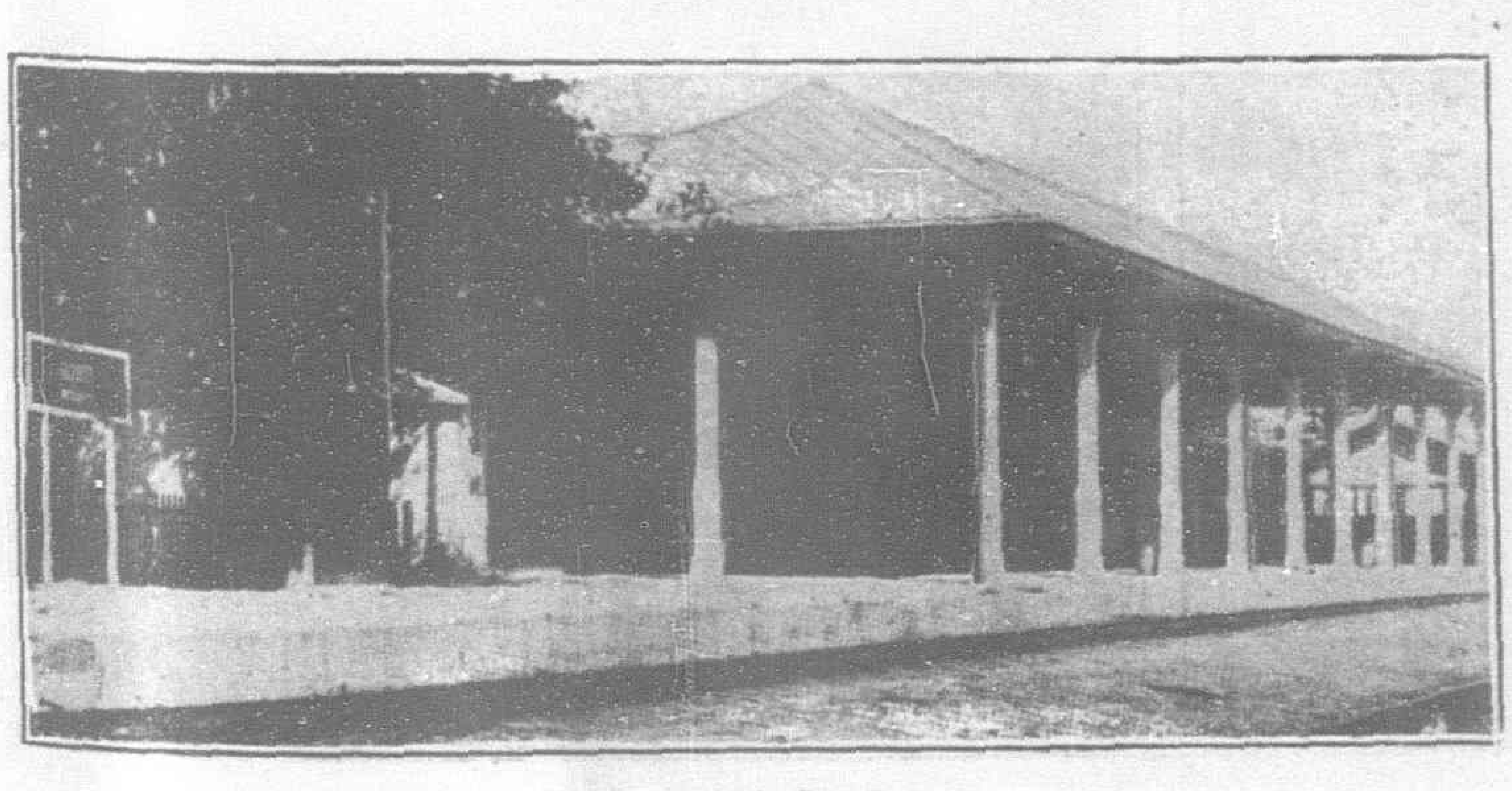
A Building Near the Chapel Royal, Bangkok, with Model of Angkor Wat in the Foreground

Southern Line.—Bangkok Noi-Sungei Golok.—At first this line was known as the Petchaburi Line and was of the metre gauge. It runs from Bangkok Noi on the right bank of the river Chao Phya due west passing the famous rice-producing plain of Nakon Chaisri to Ban Pong thence this line turns southwards and terminated at the town of Petchaburi (150 km.) well known for its sugar produce and its canes. The line is practically level the whole way through. The continuation of this line was begun in 1908. From Petchaburi the line is

Nakorn Pathom, on the Southern Line of the Siam State Railways

Wate Arun a Beautiful Bunddhist Shrine on the Menam

again practically level. It passes Hua Hin the well-known sea-side resort 213 kms. from Bangkok. Twelve kilometres further the line takes a sudden up grade of 9 per cent. to climb a hill and comes down 5 kilometres further at 10 per cent. to its former level and enters Wang Pong, an engine station 233 kilometres from Bangkok. From Wang Pong to Bang Sapan Noi 393 kilometre the line is practically on the level. Between Bang Sapan Noi and Chumphon the end of the day's journey there are a few up and down grades not exceeding 10 per cent.; the highest point reached being about 88 m. above M.S.L. Between Chumphon and Kao Plu 652 kilometres from Bangkok there are no special features to mention and the line is again practically on the level. Between here and Tung Song (757 km.), however, the line passes over undulating country but the gradient never exceeds 10 per cent. At Tung Song there is a branch line 93 kms. long going through a pass of the Tennasserim ranges to Kan Tang, a port on the Bay of Bengal. Shortly after leaving Tung Song the line begins a long climb of 5 kilometres at 7.5 per cent. up the Chong Kao Pass. Immediately after reaching the summit at an elevation of 99 m. above M.S.L. the only tunnel on the southern line is passed. At Kao Chum Tong 781 km. there is another branch line to Nakon Sritamaraj some 36 kilometres away. The main line continues over fairly low-lying lands through to Patalung Haad Yai junction (928 km.). From here two lines branch off. One to Singora and another to the frontier town of Padang Besar where it joins the Federated Malay States Railways to Alor Star and Prai, the station for Penang. This latter line runs through 46 km. of jungles and rubber estates. A rail motor tram service has been organized between Haad Yai and Singorat town. From Haad Yai the main line runs southeastwards through Tanjong Mas to the frontier station of Sungei Golok (1,144 km.) which is a joint station with the F.M.S. Railways which will eventually run through Kuala Lipis to Singapore. The interesting engineering feature to be noticed on the whole of this southern line is the amount of openings provided. A glance at the map will show how the Tennasserim ranges run along the axis of the Malay peninsula and acts as a backbone to the watershed on either side of the peninsula. All the rain water on the east side of the range drain into the Gulf of Siam and there are floods every year. Washouts are not uncomonm on one part or another of this line and more openings are being added year after year The construction of the extension of the line from Petchaburi south, in all 1,195 kms. long, has been carried out with great speed in spite of the unavoidable delays in connection with malarial fever in several districts, especially Bang Sapan, Tung Song and Klong Rum and the through service to Kedah was started in 1918.



Chiengmai Station

Underwear and Hosiery Industry in China

According to a recent report the manufacture of underwear and hosiery is one of the industries which is making great progress in China. The majority of the factories are located in the large towns such as Canton, Shanghai, Hankow, Swatow, Chungking, Peking, Tientsin and Tainan. In many cases hand-made machines are still in use, while there are many small works which are only poorly equipped with machinery. In fact it is stated that out of about 100 weaving and knitting firms only a score or so have kept abreast of the times by using modern machinery. The bulk of the latter formerly came from Great Britain, but in recent years Canadian, American and even Japanese machinery has been installed in many places.

LABUAN: continued from page 426

in the island which possess excellent steam raising qualities. The coal was worked with varying success from 1847 to 1879 when the company working the field went bankrupt through a bank's failure at home. After several fresh attempts the Labuan Coalfields Co., Ltd. went into liquidation in 1911 and since that time the mines have been idle. Subsequently the Labuan Exploration Co., Ltd. secured the lease and their geologists made a thorough examination of the island in 1919 and 1920. There are three workable seams of coal, their thicknesses being 4-ft. 6-in., 3-ft. and 8-ft. to 11-ft. respectively, and it is estimated that the main seam contains some 12,300,000 tons down to a vertical depth of 2,000-ft. The deepest workings opened up were only 600-ft. below the surface and the geologists thought that acid water did not exist below these workings. When the mines stopped working the output was about 10,000 tons per month, the cost approximating 14/- per ton f.o.b. The mines and the wharf, about nine miles away, were connected by a narrow gauge railway (now removed).

The Eastern Extension Australasia & China Telegraph Co. have a station at Labuan with a staff of five Europeans. The Brunei government has a wireless station and communication is now possible with Brunei and Sarawak by this means.

The adult European population at present is 19 and both children and adults enjoy good health as a rule. There is a resident medical officer in the island with a well equipped hospital. In 1921 the rainfall was 3415.9 millimetres and in 1922 it was 2971.1 millimetres. The mean temperature in 1922 was 81.5.

As regards education facilities there is a government English school a vernacular and a flourishing Chinese school in the town.

Three of the Straits Steamship Co.'s boats maintain a mail service between Singapore-Labuan—Borneo at intervals of about ten days. There is a good launch service between Labuan and Brunei, and various coasting vessels run between Labuan and Borneo and Sarawak.

Labuan is very much a place of "departed glory" at present; in the old days it had its governor and colonial secretary and a European colony of some size living in the vicinity of the mines. The island, it is to be hoped, will once again rise to a position of some importance, offering as it does an excellent harbor and good communications with the neighboring areas.

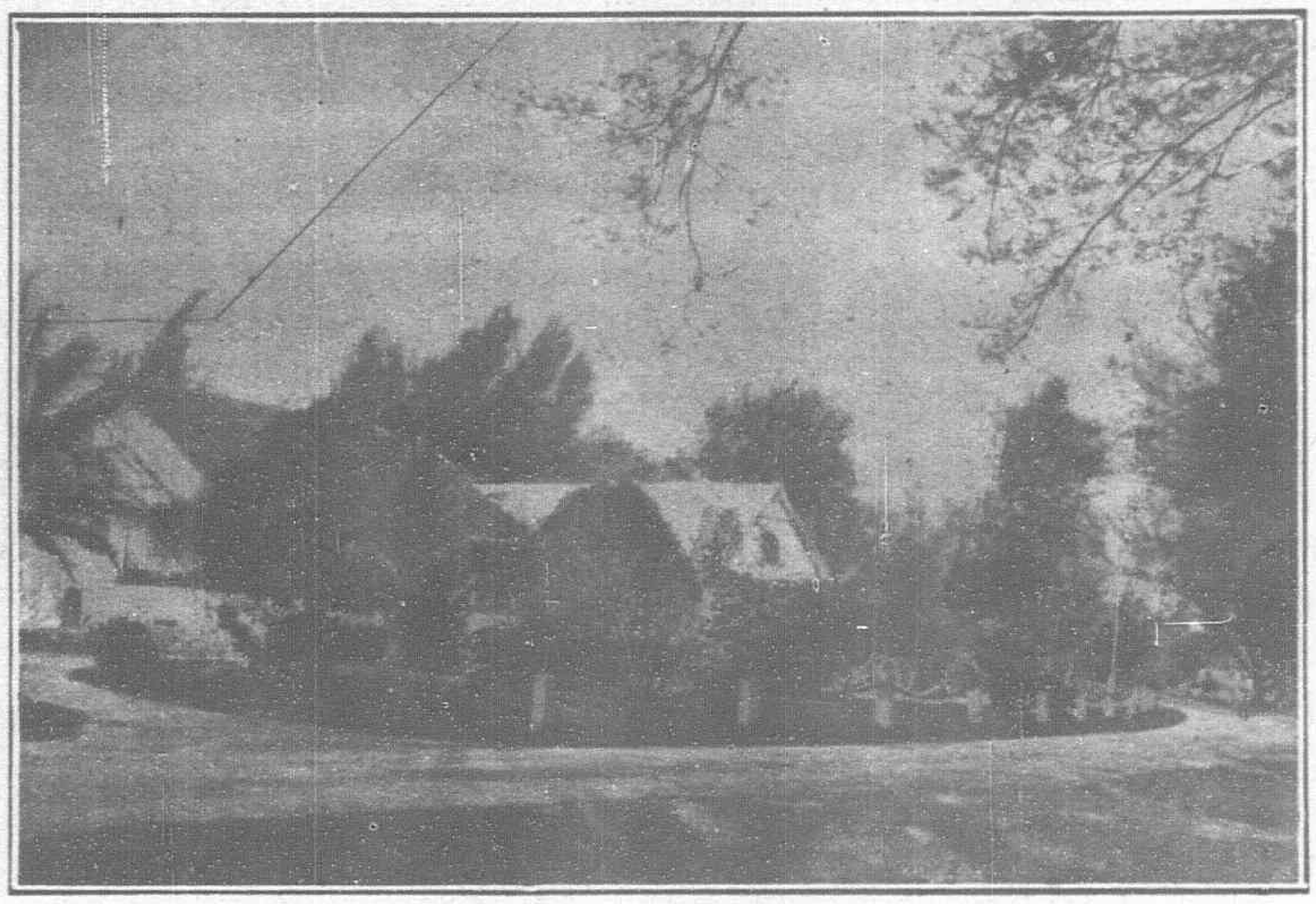
LABAUN

"A Place of Departed Glory"

By H. J. Eley (Acting Resident)

THE island of Labuan, with an area of 30 square miles, lies off the north-west coast of Borneo. It was first occupied in 1847, from 1890 to 1905 was administered by the British North Borneo Company, and in 1907 was taken over by the Straits Settlements, afterwards being constituted a separate settlement. This state of affairs exists at the present time.

In the main the island is flat, swampy in parts, with a range of hills running more or less parallel to the west coast. The central part of the island is a low lying plain. The population in 1922 was 5,922, there being about 1,000 Chinese and the remainder Malays, with a few Indians, etc. The native is the Kedayan, a peaceable and moderately industrious person, who cultivates padi, both swamp and hill varieties, and grows cocoanuts, fruits, etc. The central plain mentioned above is entirely given over to padi cultivation. The Kedayans also turn out carrying baskets of all descriptions, made from rotan, and mats. These articles met with a ready sale at the Malaya-Borneo exhibition at Singapore last year, and the baskets are still being sold at Raffles Museum, Singapore. Samples of these wares are to be sent to the British empire exhibition, but only as souvenirs, it being impossible of course to compete in the market with the European-made article. The Chinese form practically the whole of the bazaar traders and are also found in a little colony growing vegetables and fruits. The majority of the Chinese are Hokien, with some Cantonese and Hakkas.



Government Offices at Labuan

The soil of the island is not very good, but, in addition to padi and cocoanuts, pineapples, bananas, sago palm and tapioca all do very well. In the days of Sir Hugh Low a great variety of fruits was grown and found a ready market in Labuan and Borneo. Apparently cocoa and coffee were experimented with and one old resident can remember eating grapes grown on the island. Rubber is also grown by many natives having small estates, but in practically all cases it is surrendered to Chinese to work.

There are at present only some 5¾ miles of metalled road in Labuan but some grass roads exist capable of carrying vehicular traffic for some distance. The Kedayan is an excellent carrier and brings all his produce to town in the native-made baskets. The Chinese gardeners up country employ the same method.

Labuan possesses an excellent harbor, well buoyed and lighted and capable of accommodating vessels of a large size. H.M.S. *Renown* on her visit anchored within a few hundred yards of the shore. The Sarawak government has two wharves, one with a length of 232 feet and a depth of water 11-ft., and Messrs. Vanscolina & Co. have one, length 220 feet with a depth of 13-ft.

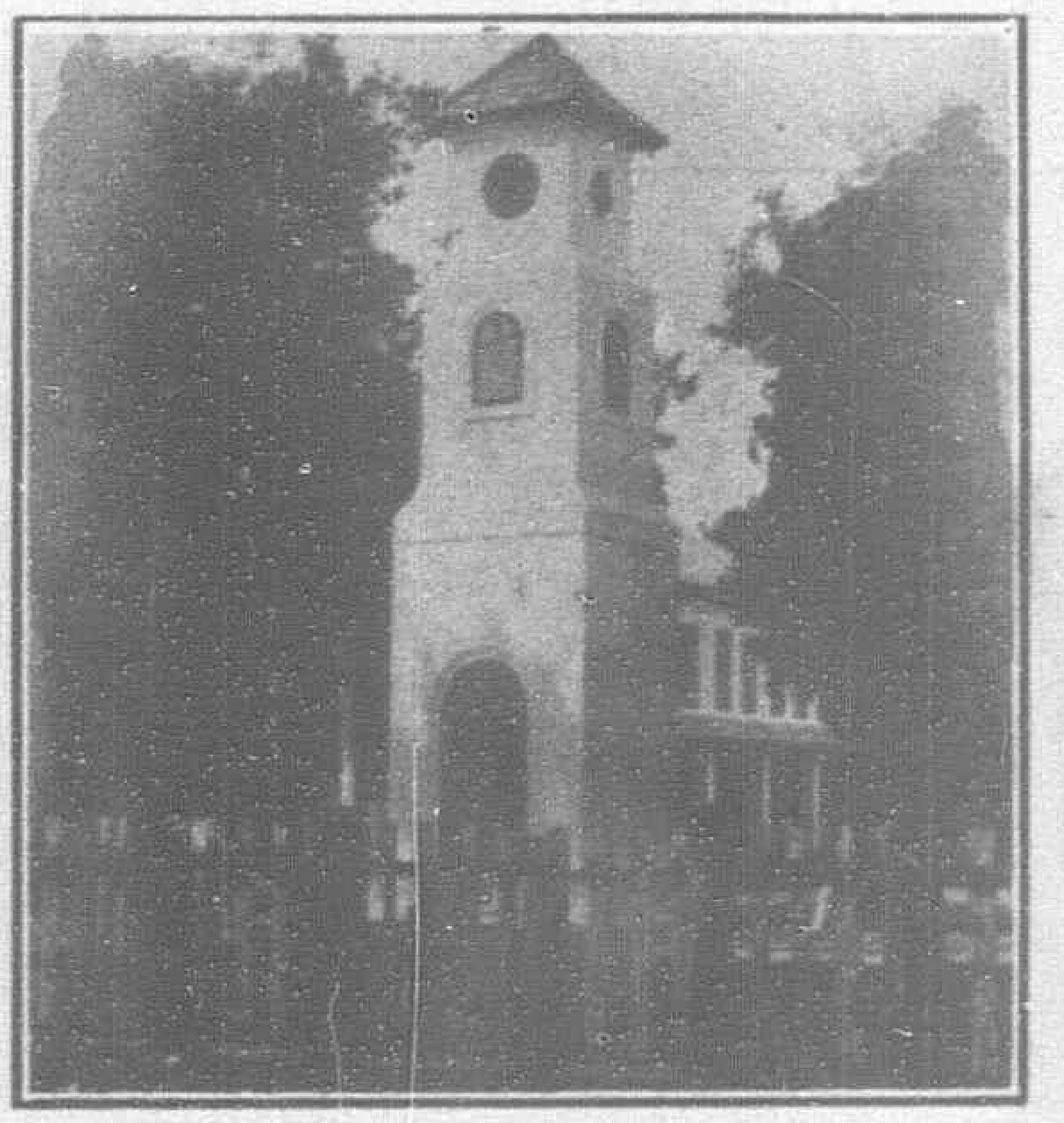
In 1922 imports from Sarawak, Borneo and Brunei totalled $819,798 and exports to these countries $718,530. The figures for 1921 were $654,557 and $792,165. The only European firm in Labuan is that of Messrs. Vanscolina & Co. The business was started early in 1911 by Mr. Vanscolina who at that time was connected with the Labuan Coalfields Co., Ltd. He now has in partnership Mr. J. S. Montgomery formerly of the Langkat-Shanghai Oil Company. The firm has its own wharf, and the offices and godowns stand in a commanding position of the sea front. It represents practically all the companies operating in Brunei and the neighborhood, and the present lessees of the Labuan mining lease have entrusted to Messrs. Vanscolina & Co. the disposal of the rights to work coal and minerals on the island. Among the chief agencies are the following:—Surveyor of Ships: Lloyds' Agent; Straits Steam Ship Co., Ltd.; Blue Funnel Line; Anglo-Saxon Petroleum Co., Ltd.; Union Insurance Society of Canton, Ltd.; China Fire Insurance Co., Ltd. Selling agencies comprise Asiatic Petroleum Co., Ltd.; Nestlé & Anglo-Swiss Condensed Milk Co.; Orr's Zinc White Ltd.; Gloria Light Co.; Rubber Estates—Brunei Rubber Estates, Ltd.; Brunei (Borneo) Rubber and Land Co., Ltd.; Brunei United Plantations, Ltd.; Lawas Planting Co., Ltd.; Liverpool (Brunei) Para Rubber Estates, Ltd.; Linkungan-Borneo Rubber Maatschappij; Sundry Commercial—Sarawaka Oilfields, Ltd.; Vamco Timber Co., Ltd.; Island Trading Co., Ltd. (Brunei) and the Labuan Exploration Co., Ltd.

The history of the working of coal in Labuan makes interesting if depressing reading. There are rich deposits of bituminous coal

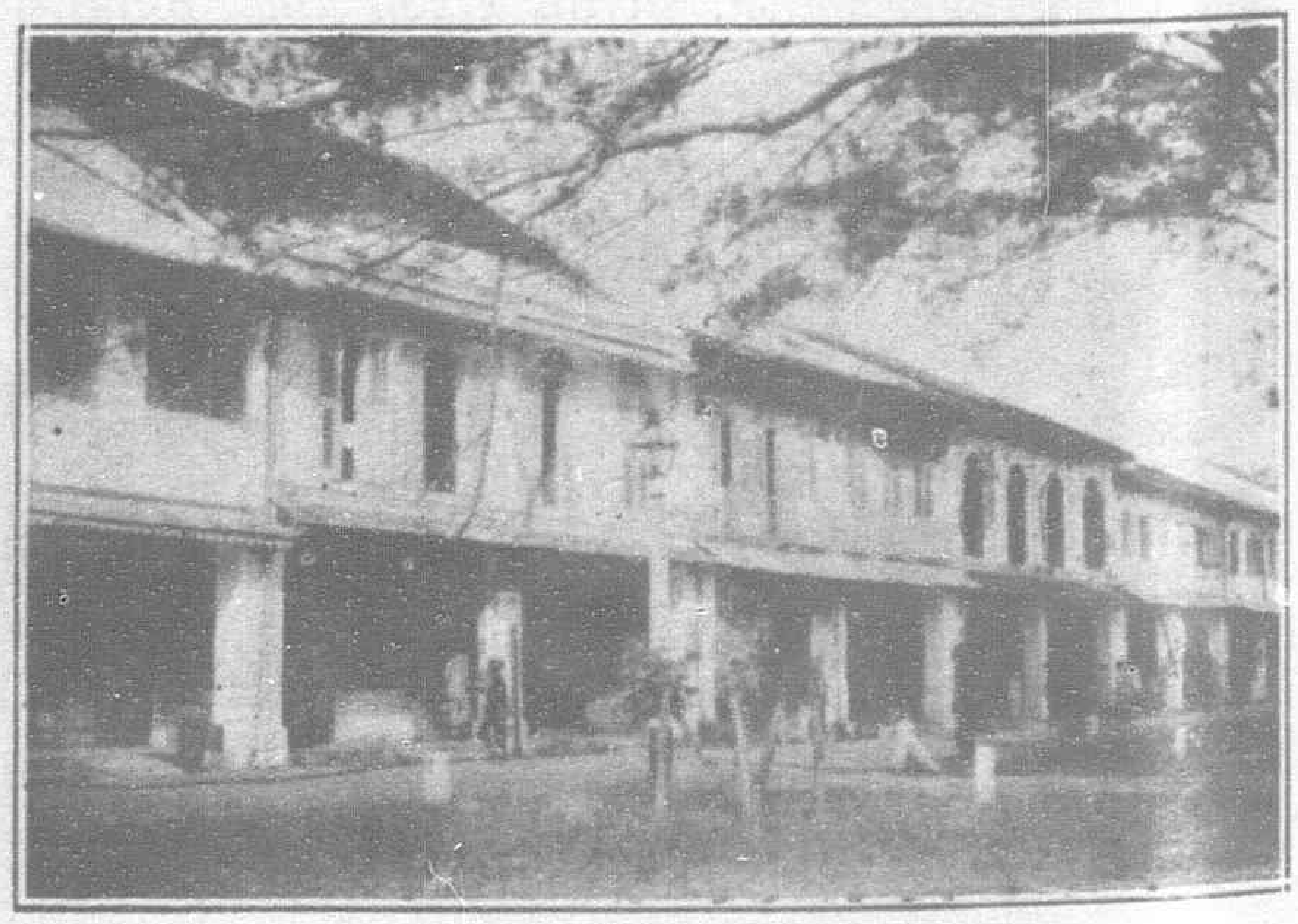
(Continued on page 425)

LABUAN VIEWS

Eastern Extension Telegraph Quarters



Clock Tower



Beach Street

The Musashino Electric Railway

THIS is a single track road running from Ikebukuro, on the Yamate division, to Han-no, a total distance of about twenty-seven and one-half miles. It is one of the many privately owned feeders to the Imperial Government Railway system, and at present is electrified for 15 miles or as far as Tokorozawa where the government aviation field is located. This section was electrified and started operation during the Spring of 1922. The present equipment consists of four—25-ton motor cars, equipped with four Westinghouse 546-J type motors, of 65 h.p., designed especially for narrow gauge railways to operate with two in series on a maximum of 1,500 volts.

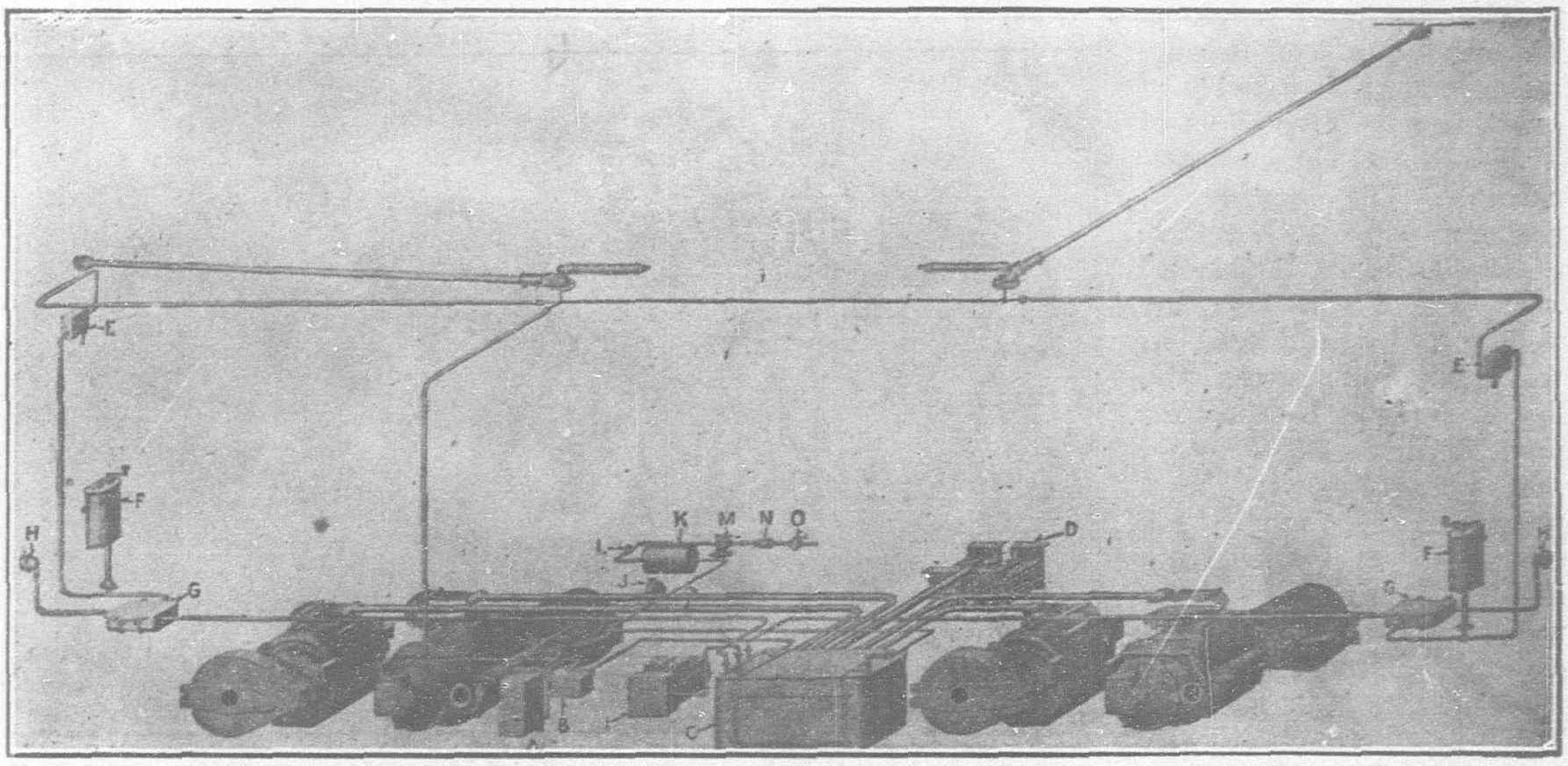


Fig. 1. Arrangement of Electrical Equipment on Motor Cars: Typical Westinghouse HL Control Parts

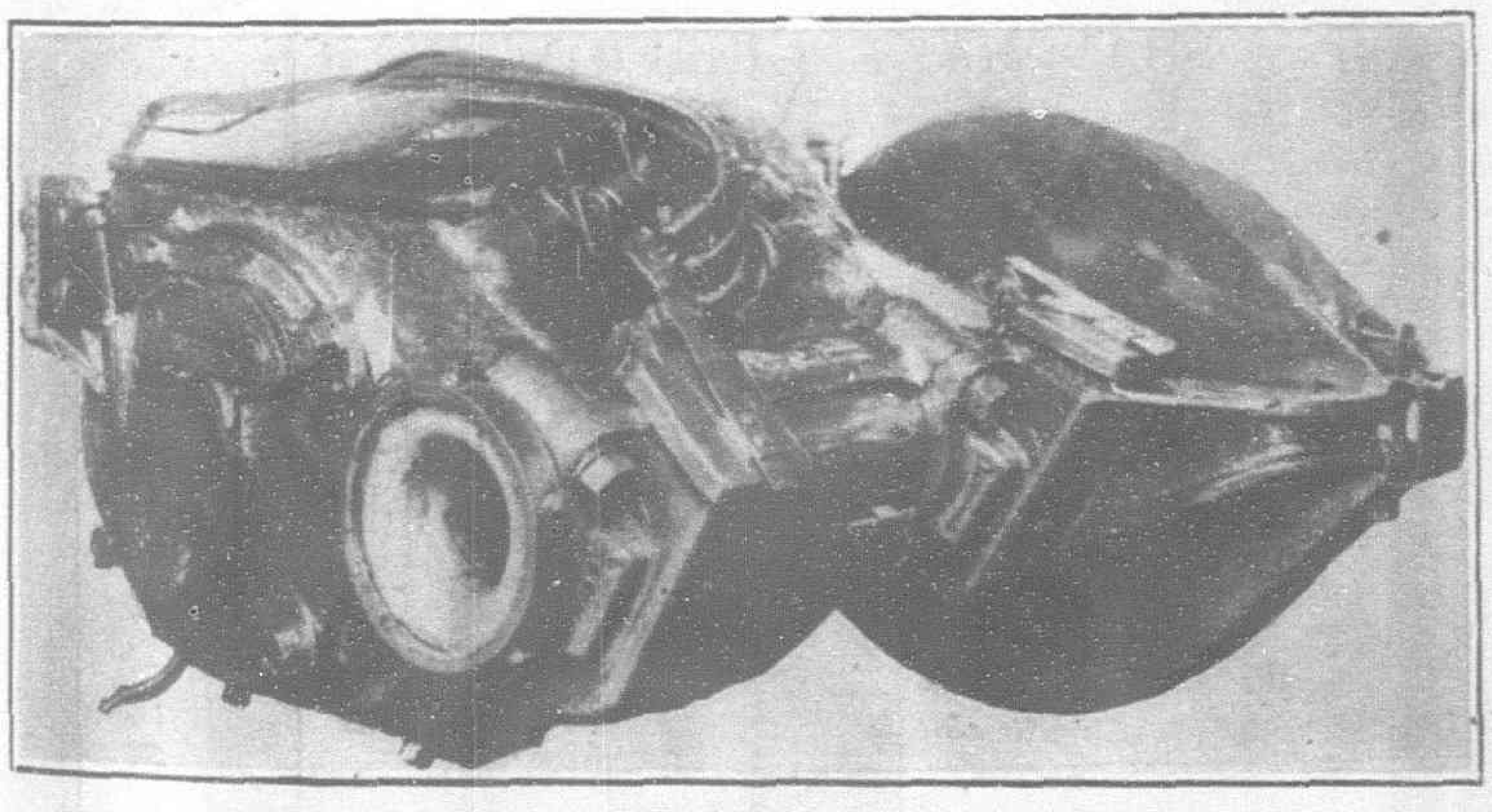
A—Main Switch
B—Main Fuse Box
C—Control Box
D—Main Grid Resistors
E—Control and Reset Switch
F—Master Controller
G—Control Junction Box
H—Tran Line Receptacle
I—Control Resistor
J—Lightning Arrester
K—Control Reservoir
L—Check Valve
M—Reducing Valve (when used)
N—O. B. Strainer
O—Cut-out Cock

These cars are also equipped with Westinghouse type HL (hand line) remote control arranged for operation with two or more cars in a train. The air-brake equipment is Westinghouse type SME, and the air supply furnished by the Westinghouse 25-ft. 1,200 compressor.

The trolley voltage is 1,200 at the substation, with an average line voltage of about 1,100. The trolley system is double catenary, with an auxilliary messenger acting as a feeder. The prevailing grade of the road is from Ikebukuro up to Han-no, with an average for this distance of about .33 per cent. The maximum grade is 1.14 per cent. for a distance of about 1.11 miles. The roadbed is maintained in excellent condition and there are very few curves.

The success of the original electrification has been so pronounced as to lead the railway to plan immediately for the extension of the electrification over the entire 27½ miles. The passenger and freight traffic is increasing from day to day. At present the freight traffic is handled by steam locomotives, pending completion of the electrification.

An order has just been placed by this company for additional rolling stock, consisting of three—33-ton electric locomotives, two motor car equipments, duplicates of the previous equipments, and two trail car equipments, which will be equipped with control details, pantagraph, and lights, to permit these cars to be operated in train with the present and new motor cars. The trail cars will be equipped with master controller so that these trains may be operated in either direction from the front end of the train.



Westinghouse Type 546 J6 Railway Motors supplied to the Musashino Railway

The control is of the master simplified variety of remote type of control used for motor cars and makes use of the standard HL control manufactured by the Westinghouse Company, and consisting of electro-pneumatically operated switches, controlled from a small platform master controller, with connections provided between cars for train operation and with a special narrow gauge type of pantagraph for current collection. This pantagraph is specially designed by the Westinghouse Company for use on narrow gauge railway lines and the primary reason for its design was the demand for such a piece of apparatus from Japanese companies. (See Fig. 1).

All of the present freight traffic is being handled by steam locomotives in trains of from 10 to 15 cars. The sidings and passing tracks now accommodate a maximum train of 15 cars. These passing tracks will later be lengthened to accommodate 20 cars. The electric locomotives are designed to handle a maximum train of 20 cars weighing 17 tons each, over the entire line at a schedule speed of about 12 miles per hour. This includes the average number of stops and delays to be encountered on this railway system.

Each locomotive weighs 33 tons, will have four axles and four motors geared directly to the axles. The motors are Westinghouse type 576-J5 railway motor and each motor has a rating of 100 h.p. at the one-hour rating, with a normal voltage of 600 per motor. They are installed for operation on 1,200 or 1,500 volt trolleys, operating two in series. The motors are field control; in other words will each have a tapped connection on the field which will be cut out for maximum speed operation. This type of motor represents the most efficient development in railway motors. It is built especially for narrow gauge service.

The locomotives as well as motor cars will be equipped with Helical type gears, which is one of the most recent developments in the design of gears for railway service. The locomtives are geared for moderate speed operation to obtain the maximum drawbar pull, which is a characteristic essential for freight locomotives. The control for these locomotives is Westinghouse type HLF (hand line field) locomotive control, which embodies the same features as to electro-pneumatic train operation and remote control features as on the motor cars.

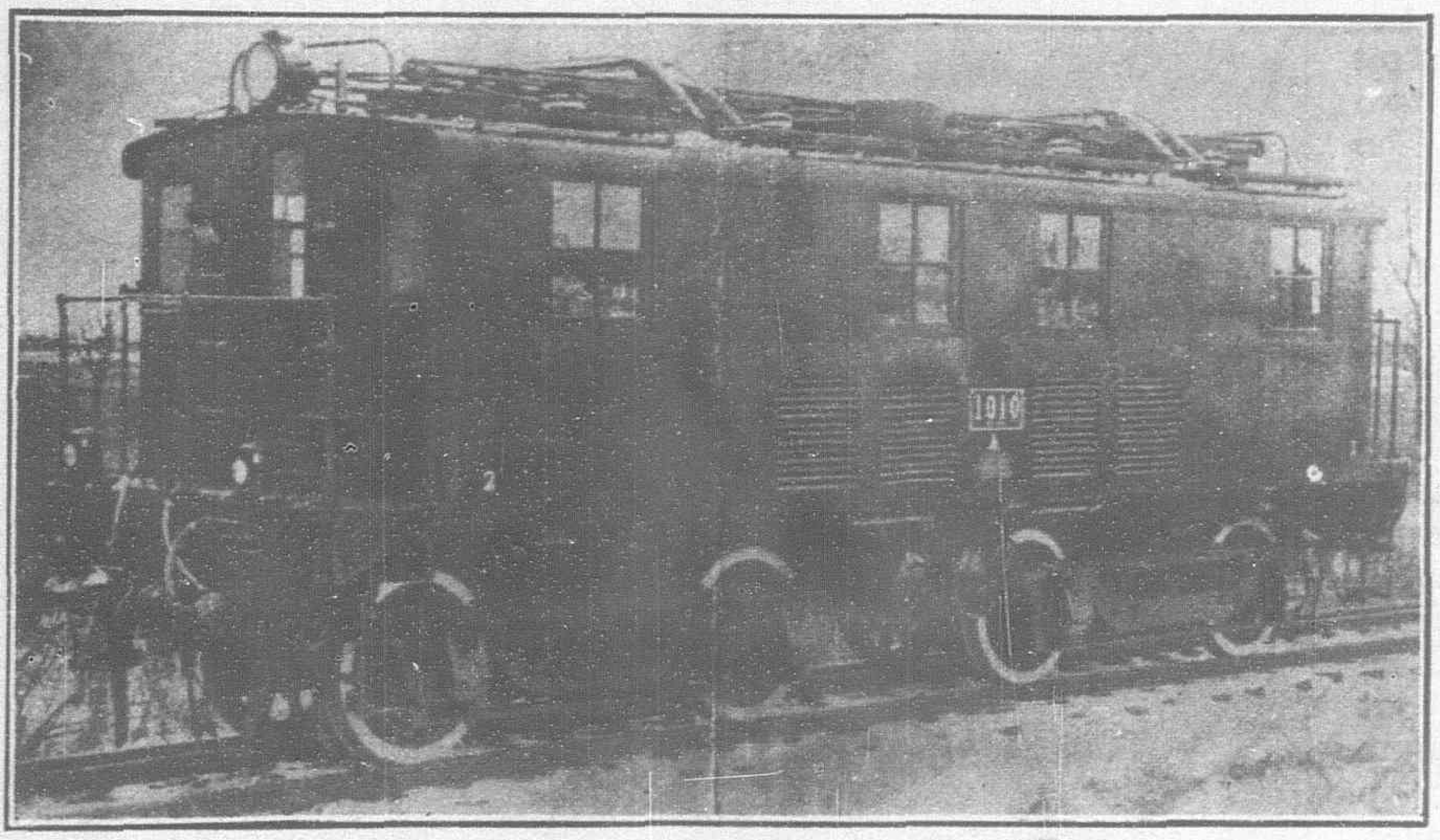
The success of the former electrical equipment was a deciding factor in the decision reach by this railway in purchasing duplicate equipments from the same manufacturer.

The current collection for these locomotives will be the same as for the motor cars. In fact, every effort will be made to make the equipment for locomotives and motor cars interchangeable. This will also hold true for the air brake equipment, especially in regard to the compressors, which will be identical for motor cars and locomotives. The locomotives will be equipped with the Continental type couplers, but provision will be made for the substitution of type MCB coupling at a later date.

Electric Locomotives for Japanese Government

On their way to Japan are two locomotives ordered some time ago for the Imperial Government Railways of Japan from the General Electric Company and built at the G. E. Erie Works. These will be tried out on the Tokyo-Yokohama line, which was electrified in 1915 at 1,200 volts direct current. The government plans in future installations, however, to use 1,500 volts.

The locomotive is of the box-cab type, equipped with four GE-274 750/1,500-volt motors, geared for a maximum speed af 40 m.p.h. Its total weight is 132,000-lb., all on driving axles, and it is capable of exerting a tractive effort of 17,000-lb. on the one-hour rating. The continuous rating gives a tractive effort of 17,400-lb. at 22 m.p.h., with 1,500 volts on the trolley. In addition to the 1,500-volt rating the locomotive can be operated at 1,200 volts at a somewhat reduced capacity, and provision is made for operation at 600 volts direct current by the throwing of a commutating switch which connects all four motors in parallel. They are permanently in series for 1,500-volt operation. Protective devices are supplied to prevent damage due to accidental contact with the 1,500-volt trolley when the commutating switch is thrown to the 600-volt connection. The leading dimensions of the locomotive are as follows:



1,500-volt, 1,040-H.P. Locomotive for Trial Use of Japanese Government Railways

Length over all	37-ft. 2-in.
Length of wheelbase	26-ft. 0-in.
Rigid wheelbase	8-ft. 6-in.
Height over pantograph (locked down)	12-ft. 10-in.
Diameter of wheels	42-in.
Gauge of track	42-in.

The GE-274 motors were designed especially for this locomotive and are the largest so far constructed for a 42-in. gauge track. Each motor rates 260 hp. on 750 volts, and is insulated for operating two in series on 1,500 volts. The motors are arranged for ventilation by means of external blowers.

One of the most interesting features of the equipment is the new electro-pneumatic type of control known as Type PCL. Two master controllers, one in each operating cab, energize the magnet valves of the pneumatically operated contactors, which open and close the main motor circuits. These contactors are closed by air pressure and opened by a heavy spring acting against the pistons. Ten control steps are provided with four motors in series and eight steps with the motors in series-parallel.

Another important feature of this equipment is the high-speed circuit breaker, which is connected between the trolley and the main part of the locomotive equipment. Under normal operating conditions this circuit breaker is closed automatically on the first point of the master controller; it then remains closed unless tripped by an overload or short circuit or by momentary loss of the control circuit voltage. After being tripped for any reason, the breaker is again reset upon the first point of the master controller. Under normal operation, however, the high-speed circuit breaker does not open with the return of the controller to the off position. This circuit breaker has no mechanical latches or triggers, but is tripped electro-magnetically. This construction makes for durability and permanence of calibration.

To protect the locomotive motors against damage due to overload, an overload relay is provided, which is so connected that in case the motor current exceeds a certain predetermined value the relay contacts open the holding circuit of the high-speed circuit breaker, which then opens and thus relieves the overload.

For collecting the 1,500-volt current, two slider pantograph trolleys (one a spare) are provided having a range of 7-ft. from minimum to maximum height. These pantographs are raised by admitting air to a set of cylinders and are held against the wire by springs, which are in turn held under tension by the compressed air in the cylinders. The contact elements consist of easily renewable copper wearing strips. A hand pump supplies compressed air for raising the trolleys for initial operation when there is no air pressure on the locomotive.

The control current is provided by a dynamotor arranged to supply 750 volts for the low-voltage control circuits and lights. In conjunction with this dynamotor there are two air compressors designed for 750-volt operation, but doubly insulated. The middle point of the air compressor circuit is connected to the mid-voltage point of the dynamotor to insure equal division of the load between the two compressors. The two blower motors for ventilating the traction motors are also designed for 750 volts each and are doubly insulated.

In the engineer's cab the master controller is located on the left side of the cab to conform to the practice in Japan of running to the left instead of the right.

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